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S. Hrg. 104–387 Pt. 5

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1996 AND THE FUTURE YEARS DEFENSE PROGRAM

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PT.5
Department of Defense Authorization...

HEARINGS

BEFORE THE

COMMITTEE ON ARMED SERVICES
UNITED STATES SENATE

ONE HUNDRED FOURTH CONGRESS

FIRST SESSION

ON

S. 1026

AUTHORIZING APPROPRIATIONS FOR FISCAL YEAR 1996 FOR MILITARY ACTIVITIES OF THE DEPARTMENT OF DEFENSE, FOR MILITARY CONSTRUCTION, AND FOR DEFENSE ACTIVITIES OF THE DEPARTMENT OF ENERGY, TO PRESCRIBE PERSONNEL STRENGTHS FOR SUCH FISCAL YEAR FOR THE ARMED FORCES, AND FOR OTHER PURPOSES

PART 5
ACQUISITION AND TECHNOLOGY

MARCH 14, 28, 30; APRIL 6; MAY 5, 17, 1995

Printed for the use of the Committee on Armed Services

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DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1996 AND THE FUTURE YEARS DEFENSE PROGRAM

TUESDAY, MARCH 14, 1995

U.S. SENATE,
SUBCOMMITTEE ON ACQUISITION AND TECHNOLOGY,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

TECHNOLOGY BASE PROGRAMS IN THE DEPARTMENT OF DEFENSE

The committee met, pursuant to notice, at 2:34 p.m., in room SR–222, Russell Senate Office Building, Senator Bob Smith (chairman of the subcommittee) presiding.

Committee members present: Senators Smith, Inhofe, and Bingaman.

Committee staff members present: Richard L. Reynard, staff director; and Christine K. Cimko, press secretary.

Professional staff members present: Jonathan L. Etheron, Stephen L. Madey, Jr.

Minority staff members present: John W. Douglass and William E. Hoehn, Jr., professional staff members.

Staff assistants present: Menge Crawford, Pamela L. Farrell, and Shelley G. Lauffer.

Committee members' assistants present: Thomas L. Lankford, assistant to Senator Smith; Glen E. Tait, assistant to Senator Kempthorne; Matthew Hay, assistant to Senator Inhofe; Richard W. Fieldhouse, assistant to Senator Levin; Steven A. Wolfe, assistant to Senator Kennedy; Edward McGaffigan, Jr., assistant to Senator Bingaman; John P. Stevens, assistant to Senator Glenn.

OPENING STATEMENT OF SENATOR BOB SMITH, CHAIRMAN

Senator SMITH. The committee will come to order. And I would like to start by welcoming Dr. Kaminski. Is it doctor? Did I get that right? Secretary Kaminski.

And also Dr. Jones, it is nice to have you here.

You will be the first panel after a very brief opening statement. And then we will proceed to your statements and some questions.

This afternoon, we are going to begin a series of hearings on the programs and issues that our subcommittee will be addressing in making its recommendations to the full committee during the markup of the Defense Authorization Act for fiscal year 1996.

This is my first hearing as the chairman of the subcommittee. And as I assume that role, I am mindful of the fairly big shoes that I have to fill here.

My distinguished predecessor, Senator Jeff Bingaman, has set a very high standard for detailed review and oversight of the numerous programs and issues that come before this subcommittee.

And he always carried out his responsibilities in a completely bipartisan fashion. I hope I am up to the task of doing exactly the same with Senator Bingaman. I am pleased that he will be the ranking member of this subcommittee during this Congress.

The Subcommittee on Acquisition and Technology has jurisdiction over the so-called technology base programs in the Department of Defense budget request.

These programs, totalling just a little over $9 billion, represent the foundation for the long-term technological superiority of the United States' Armed Forces.

Given the environment of constrained budgets and emphasis on near-term readiness concerns, we are going to have to vigorously defend essential technology base programs.

In my view, we will only succeed if we can argue convincingly that the technology base program we are prepared to recommend consists of projects and activities that meet the test, my test, and I think it is a good test, of having a definable payoff for our national security.

It is my intention to subject each of the line items in the jurisdiction of this subcommittee to careful review to establish relevance to national security objectives. If they meet that criteria, they should be funded. If they do not, then they should not, at least not in the defense budget.

Nonetheless, we must be mindful of the unique features inherent to research and development in the technology base programs. This activity is characterized by very high risk. Many will have no direct payoff, because the technologies simply do not prove out.

Research at these early stages often has multiple potential application, sometimes commercial use. Therefore, developing partnerships with commercial industry, complete with cost sharing, is an appropriate strategy for making some new technologies available for military use.

Finally, technology base programs represent high leverage investments in that relatively small amounts of funding can result in significant technology payoffs in the long term.

Therefore, we must not allow ourselves to be driven by excessively rigid or simplistic methods of assessing programs and their national security relevance.

The hearing this afternoon is intended to help us begin the process of reviewing the administration request within the context of the current realities.

The budget request for the technology base programs in the Department of Defense for fiscal year 1996 is nearly 10 percent less than the amounts appropriated for the same programs last year. The reduction is particularly dramatic in the Army program.

We need to ensure that reductions of this magnitude will not compromise the long-term effectiveness of our military. The share of the request devoted to the infrastructure supporting technology programs is increasing, leading some of us to question whether we are funding an infrastructure that is larger than our current or projected needs.

And I hope the witnesses will address that specifically, as I am sure they will.

The witnesses today, Dr. Paul Kaminski, the Under Secretary of Defense for Acquisition and Technology, and the service acquisition executives from each of the services, Mr. Gilbert Decker from the Army, Ms. Nora Slatkin from the Navy, and Mr. Clark Fiester from the Air Force, are in position to relate the request for the technology base programs to the broader acquisition plans of the Department of Defense.

They are well qualified by background and experience to help us understand the manner in which the requested programs will provide for our technology needs into the foreseeable future and beyond.

Before I turn to Dr. Kaminski, I would like to turn to Senator Bingaman, my friend from New Mexico.

Senator BINGAMAN. Thank you very much, Mr. Chairman. Congratulations on your chairmanship here. And I hope our efforts will proceed. I am sure they will.

I like to think of this subcommittee as an island of bipartisanship in a sea of rancor, which seems to be the case around here these days more and more.

But it is a pleasure to work with you. It was a pleasure to work with you in the previous Congress, and I look forward to it again in this Congress.

Let me just go through a very brief statement that we have made here. It has been prepared, since this is the first of our hearings.

This first hearing has traditionally been an overview hearing, a time to discuss the major issues that the subcommittee is intending to follow during the legislative year. I know that we have an excellent group of witnesses today to give us that overview.

This subcommittee, ever since Senator Quayle first chaired it in 1985, has been responsible for the long-term technology base investment issues.

And we work with the executive branch to sustain the basic and the applied research budgets of the Department of Defense, because history has shown that those investments pay for themselves many times over.

I do want to note my concern that this entire Pentagon technology base budget is now, unfortunately, being listed among the so-called non-defense items in the Defense budget that are compiled by some who do not believe that the technology base is important to our defense needs.

I think we are very lucky that our predecessors in both the post-World War II generation, led by people like General Eisenhower, who was then chief of staff of the Army, did not take such a short-sighted view. I am also convinced that this generation will not, in the final analysis, take a short-sighted view either.

As former Secretary of Defense Schlesinger said a couple of weeks ago, whether we like it or not, we are now committed to a high-tech military establishment, which, incidentally, will have spill-over to our larger society.

So our task is to make the most efficient use of the technology base investment for which the administration is requesting $4 billion in 1996, fiscal year 1996. That is about the same amount that we have been spending for more than two decades in real dollars.

This investment in our defense technology base is our primary window into the enormously larger private sector and university research efforts and our key lever for utilizing the investments of industry and other Federal agencies to achieve critical long-term military goals, such as dominant battlefield awareness, which I hear more and more of from people in the Pentagon these days.

Let me just finish by saying that I am concerned about the trends in our national R&D investment. Industry investment has been flat now since the late 1980s. Federal research investment has been declining in real terms and will continue to do so under the budget proposed by the President.

Recision bills that are currently under consideration in the Congress make significant cuts in research spending across government. And I think we are in danger of seeing in the 21st century a century where American economic and military leadership could be lost if we do not sustain our commitment in these areas.

Finally, there are a host of other issues that we need to look at. The infrastructure, where 6.5 accounts increasingly appear to be out of balance with some of the rest of DOD's research budget.

Last year, we enacted legislation to require the Defense Science Board to review FFRDC compensation and the role of the FFRDCs in DOD research. I am eager to see how that is progressing.

Clearly, we need to pursue these important issues on a bipartisan basis, and I am persuaded we can do that very effectively this year. Again, I pledge support to you in going through this and the other hearings that you have scheduled for this year.

Senator SMITH. Thank you very much, Senator Bingaman.

Dr. Kaminski, as usual, your full statement will be made a part of the formal record. If you could summarize it in 10 minutes or so, it would be appreciated.

STATEMENT OF HON. PAUL G. KAMINSKI, UNDER SECRETARY OF DEFENSE FOR ACQUISITION AND TECHNOLOGY; ACCOMPANIED BY ANITA JONES, DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING

Dr. KAMINSKI. Thank you, Mr. Chairman. I will do just that.

Mr. Chairman and members of the subcommittee, thank you for the opportunity to appear before you today to discuss the Department of Defense science and technology programs.

I would like to introduce Dr. Anita Jones, the Director of Defense Research and Engineering, and also the three service acquisition executives sitting behind me, Mr. Gil Decker, Army acquisition executive, Mr. Clark Fiester, Air Force acquisition executive, and Ms. Nora Slatkin, Navy acquisition executive. I have never had the pleasure of working with a more able team.

The Department of Defense's technology program is founded on two key underlying objectives. The first is relevance to the warfighter, and I will talk some about how that relevance is determined and where some of our priorities sit.

The second one is recognizing the reality of current times and emphasizing the issue of cost of our future programs.

Let me talk a little bit about those two principles in turn. The first one, supporting the warfighter. The joint staff and the Joint Requirements Oversight Council, the JROC, have identified five future war fighting capabilities most needed by our U.S. combatant commands for coping with the post-Cold War world.

These are in turn, number one, to maintain near perfect real time knowledge of the enemy and communicate that to all forces in near real time, the so-called dominant battlefield awareness issue and the closure that goes with it.

Our warfighters need to know where the enemy is and what his capabilities are, where the friendly forces are and what range of actions each could execute in that circumstance. In addition to this scope of information, warfighters need information in a timely manner to conduct their mission.

The Department's S&T program is emphasizing several promising advanced technologies to achieve dominant battlefield awareness and the appropriate action cycle times. The issue here is known in operational terms as the sensor-to-shooter problem, and I would say another component, the bomb damage assessment problem that follows, so you know the consequence of the action. And the issue here is providing the information through this connection and reducing the cycle time.

Important advances in our current program are being pursued in information surveillance, information management and the dissemination of that information to our operational forces.

The current family of programs that we have underway in our advanced concept technology demonstration (ACTD) family include a family of unmanned airborne vehicles or UAVs. This program is providing us with a technology ramp, so to speak, in airborne surveillance and reconnaissance capabilities.

We have three candidate ACTD new starts in the 1995/1996 program that are looking at innovative ways to decrease the action cycle time of U.S. forces by addressing the growing need to process, use and then disseminate our intelligence.

These candidate activities include semi-automated imagery intelligence processing that is assisting the human operator in processing this information, ground-to-ground and air-to-ground combat identification to deal with the fratricide problem, and battlefield awareness and data dissemination.

I would also commend to you some of the future descriptions that you will hear about efforts underway in the services.

In particular, I would draw your attention to the Army's efforts to "digitize the battlefield" and connect their systems, both in the long run with an open architecture system using commercial standards and protocols and in the short run using appliques to equip current systems to provide a near-term capability.

The second warfighter need on the priority list is to engage regional forces promptly in decisive combat on a global basis. Prompt reaction to regional conflicts has two underlying components. The first component is global mobility, and the second is the tools to support decisive combat.

Technological advances in our aircraft propulsion have dramatically improved the Department's performance in the Air Force global reach/global power activity.

The Department's program in 6.2 and 6.3, in integrated high performance turbine engines, the so-called IHPTET program, is budgeted at about $134 million in 1996. This program is aimed at providing a 100 percent improvement over the 1987 baseline in the thrust-to-weight ratio of high performance fighter engines by 2003.

Substantial strides are being made in the Department's 6.2 exploratory development programs to reduce the weight of our heavy Army and Marine forces so that they can be sea deployable in half the time with half the ships.

War fighter number three need is to employ a range of capabilities more suitable to actions at the lower end of the full range military operations, which allow achievement of military objectives with minimum casualties and minimum collateral damage.

The principal challenge here is to limit casualties and collateral damage. The activities include advances in precision targeting and controlled destruction, particularly in settings where enemy combatants mingle with civilians, and we are required to limit collateral damage and casualties.

The Marine Corps, the Army and several CINCs are sponsoring a candidate fiscal year 1995/1996 ACTD program new start on military operations in built-up areas.

This ACTD would serve as an integrating effort to demonstrate new operational capabilities in urban settings using mature and emerging technologies from the Department's portfolio of 6.2 projects on non-lethal weapons, surveillance, sensing, target detection and situational awareness.

The warfighter's fourth need is to control the use of space. In Desert Storm, space-based systems provided coalition forces with communications, navigation, weather monitoring, threat warning, intelligence collection and provided a decisive advantage in situational awareness. Without assured access to and control of space, this advantage would be lost.

The Department has embarked on a wide range of space vehicle and booster programs in the 6.2 and 6.3 development category. The Air Force has budgeted $30 million in fiscal year 1996 to reduce the size and the weight of extremely high frequency payload on the Milstar communications satellites.

Navigation warfare is another candidate ACTD for a new start in fiscal year 1995/1996. This ACTD would demonstrate systems and concepts to deny the enemy use of navigation information, including the Global Positioning System, while assuring access to these same systems by U.S. forces.

The fifth warfighter need is to counter the threat of weapons of mass destruction and future ballistic and cruise missiles to the CONUS and to our deployed forces. Weapons of mass destruction, theater ballistic missiles and anti-ship cruise missiles today present a wide range of serious threats to U.S. forces.

Our Ballistic Missile Defense Organization has a robust ballistic missile defense technology program in place to counter validated threats.

And the Navy is sponsoring a "Mountain Top" ACTD program to demonstrate over-the-horizon detection, tracking and engagement of cruise missiles from an elevated sensor suite.

A candidate fiscal year 1995/1996 ACTD new start on counterproliferation would demonstrate an improved counter force capability to survey and strike weapons of mass destruction.

My principal responsibility as the Under Secretary for Acquisition and Technology is to work closely with the Joint Requirements Oversight Council, my operational counterparts, to ensure that the Department fields effective and technologically superior weapons systems at an affordable cost.

But to do that, we must have a suitable technology ramp in place before we can initiate a robust procurement program.

Today's leading edge systems were made possible through decades of investment and fundamental science and exploratory development work.

The technology ramps that were initiated in the early 1960s and sustained in the mid-1970s gave us stealth aircraft, precision-guided munitions and night vision systems that provided U.S. forces with a decisive combat edge during the Gulf war.

In some cases, it is difficult at the start of a new technology to see the end application, which often can be more than 20 years away. So sometimes it is hard to find the precise linkage between a specific technology and a stated operational need.

There is an example here that I would like to discuss concerning a program that I was personally involved with in years past. It is the Air Force F–117 stealth fighter, one of the very high value strike weapons of Desert Storm. The F–117 provides a very good example of the need for a stable, long-term investment in the key enabling defense technologies.

The F–117 became operational in 1983, in ample time for use in the Persian Gulf conflict. If I might have the first slide, please.

In 1977, after a couple of years of development in a program very similar to our ACTDs being conducted today, two prototype aircraft were developed and flown in a program named Have Blue.

We actually ended up losing both of those aircraft by the time the program was completed, but we gained the underlying understanding of stealth technology to know that we could apply it to an operational fighter aircraft at the time.

So what we did was transition from this program—next chart—to the full-up F–117. This was done in record time with a very streamlined program. We went from that prototype to an operational, in-place force of F–117s in a period of 6 years, from 1977 to 1983.

Next chart.

STEALTH FIGHTER TECHNOLOGIES IN HAND

- Digital Fly-by-Wire Flight Controls
- Radar Cross Section Mathematical Tools
- Radar Cross Section Test Ranges
- Computational Fluid Dynamics Codes & Wind Tunnels for Inlets & Airframe
- Forward Looking Infra Red
- Target Tracker
- Laser Designator

Dr. KAMINSKI. What many people do not realize is that while huge breakthroughs were achieved in the underlying stealth technology, the F–117 would not have been possible without this whole list of technologies that had been developed over a period of as much as 20 years.

The F–117 was critically dependent upon digital fly-by-wire flight controls, because it was not a statically stable or dynamically stable platform. It had to be sensed and controlled.

The radar cross-section mathematical tools that were critical to this program and the underlying test facilities and in some of the materials, as well, had a foundation back in the Advanced Ballistic Reentry Evaluation System (ABRES) program that was conducted in the early 1960s.

People developing those codes and the underlying materials technology at the time really were not working on aircraft applications. They were working on missile system applications at the time.

Our work in computational fluid dynamics and codes, as well as the underlying wind tunnels that were in place, represent an infrastructure that was absolutely critical to integrating all the pieces of the technology and to produce inlets, which at the same time were low radar cross-section but had suitable loss provisions to produce an aerodynamically feasible platform.

And we adopted work from other platforms in forward-looking infrared and laser tracker and designation systems to identify and track targets and to target our precision-guided weapons that were delivered from this platforms.

So this issue of relevance that I spoke about before sometimes is hard to nail down precisely at the beginning of the program.

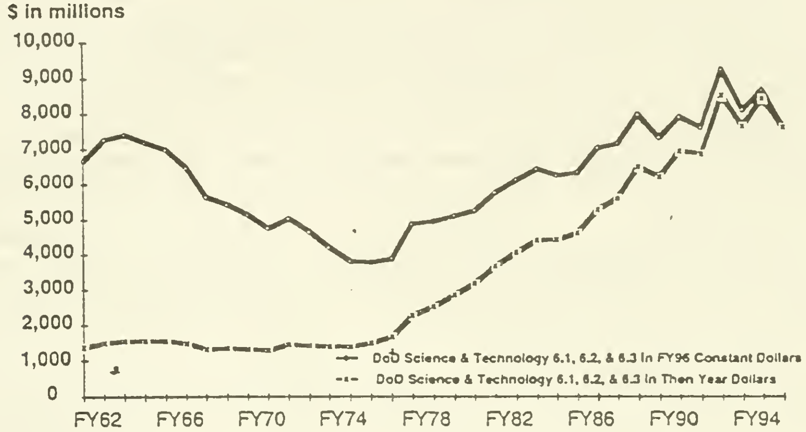
My point is, to be able to make very rapid progress, you need to have in place these technology ramps that have been developed from a broad and diverse program put together in a balanced way over a period of time.

Now, to sustain the technical advantage of U.S. forces, the Department must continue to establish stable and sustainable technology ramps for tomorrow's systems.

The President's fiscal year 1996 budget submission contains $7.6 billion for the Department's S&T programs in 6.1, 6.2 and 6.3. This excludes, I might add, the S&T programs for the BMDO.

Let me indicate here an historical funding chart for our S&T program, and this chart has two curves. The bottom line in blue is in then-year dollars. The top line in red is in constant fiscal year 1996 dollars, so that you can have a comparison without inflation.

Research Categories 6.1, 6.2, & 6.3 Funding



If you look at this program, you see an early peak there in fiscal year 1962 of about $7.4-or-so billion, a drop through the mid-seventies to a level of around $4 billion. And then a buildup again close to the level that was sustained in fiscal year 1962.

You do see adjustments that have been made in the last couple of years. And, in fact, that sharp drop that is indicated between 1995 and 1996 is the roughly 10-percent adjustment, Mr. Chairman, that you talked about in your opening statement.

Now the issue here is to make this a long-term and sustainable program. And we certainly cannot be proceeding with sequential 10-percent cuts per year and achieve that long-term stability and underlying strength in the program.

We will need to sustain this program on a sound and supportable basis over the long term, in consonance with the types of norms that have been illustrated here over the past 30 years or so.

Our budget authority for science and technology in fiscal year 2001 is projected to rise some from this level in 1996. It is to be about 18 percent higher in then-year dollars than indicated in 1996.

This amount in 1996, I believe, is a prudent minimum level required to be able to initiate the series of technology on-ramps that are the foundation for our future war fighting needs.

I discussed earlier several candidate ACTD projects. ACTDs are a new mechanism established by the Department in budget category 6.3, whose purpose is to rapidly transfer technology from the development stage to users.

Our ACTDs are heavily user-oriented. And the concept of an ACTD is to apply an integrating effort to assemble and demonstrate significant new military capability within a very short cycle time.

It is based on mature advanced technologies at a scale size adequate to establish operational utility and system integrity—using a small number of systems.

The idea is to demonstrate a jointly implemented program of material development to include user and development communities together as key participants.

ACTDs allow the warfighter to: (1) evaluate the military utility of the technology before we commit to a major acquisition effort; (2) develop concepts of operation for employment of the new technology before it is fielded; and (3) retain a low-cost residual operating capability, if it turns out to be useful.

ACTDs marry technology and employment doctrine. This is another very important feature—combining these two allow us to develop the technology and figure out how best to use it in our war fighting systems.

I think we in the United States have traditionally underestimated the importance of developing the appropriate tactics and doctrine for our technology and the associated training of the people who will use the technologically advanced system. This all has to come together as a unit.

Again, as I look back to my own experience on the F–117 program and note that as advanced and significant as the technology was, I think one of the major contributions in that program had to do with the efforts undertaken to understand the limitations as well as the strength of the technology. The effort to develop the mission planning tools to work around the limitations that were inherent in the system allowed it to be effectively employed. And so, the user did not really notice any significant operational limitations because of the way the planning tools had been developed to work around the technical limitations of the system.

Our leverage here was obtained by people—by warfighters doing things that were not standard from their previous tactical training and doctrine.

So our resources here were: our simulation tools, our test ranges and facilities, and an openness to think about things in a different way. These resources were as critical as was the stealth technology in bringing about a new capability for the Department.

It is the reason why I feel our ACTD programs are critical—they allow us to do this very thing with real system prototypes in the field at an early stage. They are supported by our critically important program of broad-based, advanced distributed simulation to allow the operator again to have early insight into what a new system or technology can do.

But if I may, Mr. Chairman, let me say just a few more words about the second objective, cost reduction. It is the second underlying principle in our program, and it faces a reality today that cost is a very important element in our future system trades.

The Department's most prominent technology thrust in this area of improved affordability includes improved modeling and simulation tools to be able to do a better job of designing. By using advanced distributed simulations to look at the impact of new systems on our forces, and through the use of costing tools, we can make more informed cost performance trades earlier in the development of our systems.

The Department's affordability thrust also includes work on advanced manufacturing processes to be able to build things at lower cost and work to monitor how our systems are doing over a period of time. For example, through the use of imbedded corrosion and fracture sensors, we learn something about and extend the lifetime of our equipment.

We are placing a much greater priority on reducing the cost of our systems. I have for a demonstration, Mr. Chairman, a night vision scope. This system was recently developed. It operates on a different principle than our cocl night vision scopes.

Would you pass that up front?

The impact here is that the weight is reduced from 4½ to 3¼ quarter pounds. The power requirement is down by half. And for those who are accustomed to supplying batteries to equipment in the field, this is a big advantage operationally.

The sensitivity is up by a factor of five. And the most important issue, the cost is down to one-tenth of the system that it replaces.

The Department is placing far greater reliance on commercial sources to make our weapon systems more affordable. It is here that ARPA's Technology Reinvestment Project plays a very big role. It is leveraging off a commercial production base, in which commercial production and design to reduce costs almost always go hand in hand.

The Department is putting a great deal of emphasis on taking advantage of commercial production to manufacture defense equipment. If we can produce weapon system platforms on commercial lines, it will, however, be more the exception than the rule.

On the other hand, there is great potential for producing at the subsystem or the critical component level of assembly on commercial lines.

A good example of this approach is the Department of Defense investment in electronic packaging techniques, our program of multi-chip modules.

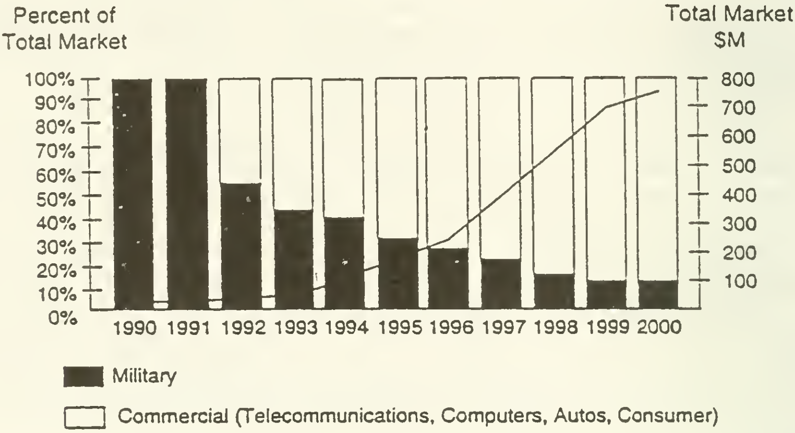
Mr. Chairman, have we got it to work?

Senator SMITH. It does not work with the lights on, I can tell you.

Dr. KAMINSKI. Mr. Chairman, this chart, I think, gives a picture that we will see repeated many times. In fact, we have already seen it happen in other areas in the past. Plotted on the left side is the percent of the total market.

This is for a family of products called multi-chip modules, and I will show you an illustration in a minute. The idea is to combine many pieces of semi-conductor die in one package, rather than using the large board.

Merchant MCM Market Segments



On the left is the percent of the market shaded in black for military use. And you can see that in 1990, 1991, we had 100 percent of the market. Commercial use had not really begun for this product as yet.

If you look at the upper sloping curve to the right, that goes with the axis on the right, and that shows what the total market size is. As you can see in 1990, the total market size was less than $50 million. So it was a small market, and DOD had it all.

Now, as time progresses, our forecast is that this will grow to a $750 million a year market by the year 2000. And at that point, the military percentage would only be about 10–15 percent. Our use will double to $100 million a year.

But the big change in this process will be cost reductions. We would expect, through this period of time, to see cost reductions per unit of functionality by a factor of five or more.

Let me indicate for you what this technology means. You can see why it was important initially for the Department of Defense and why in time it will be important for a broader commercial use. Here is a whole board populated with semi-conductor chips, processors and memories.

In the center of this—forget the gold parts, which are wires—the piece that is in the center of this one-inch square chip is the functional equivalent of that board.

While this is about equal in cost today, our projection is, as this matures, this has the potential to cost a factor of five or less than the cost of that board.

Senator SMITH. How many years between the two?

Dr. KAMINSKI. The technology represented in that first board is probably about 6 or 7 years behind the MCM packaging.

Senator SMITH. And how many years to get from here to here, from one to the other?

Dr. KAMINSKI. I would say it is about a 6 or 7 year delta.

Now, the idea here is not only to leverage off the commercial technology and development but to leverage off the commercial production line.

By working together with commercial developers through programs like our Technology Reinvestment Project (TRP), the Department benefits by being able to buy off those very same commercial lines and capture savings in the price we pay.

My underlying philosophy on the TRP program is very simple. I have no interest whatsoever in seeing a commercial capability developed if the DOD is not planning to buy off the commercial line and save money in the process.

I am interested in the lowest priced product for the DOD, and if the path is through a commercial production line, then that is a solid path. But I am not interested in that path unless it provides a benefit to the Department.

Mr. Chairman, I have been in my job now for about 5 months. So with respect to the TRP, I can say it was not invented on my watch.

But I must say that if we did not have a TRP program today, it would be precisely the type of program that I would be recommending to you to support this underlying strategy in doing more with less to leverage off commercial technology development and commercial production lines where I could.

In summary, every major weapon system in the U.S. inventory today has been leveraged from decades of direct investment in the critical, enabling, underlying technologies.

These systems exist because of the technologies and the concepts that were developed by teams of people, dedicated researchers at our universities, our defense laboratories, our test centers and our industrial contractors. The DOD is committed to maintaining a legacy of technological supremacy in our future systems at an affordable cost.

Our fiscal year 1996 budget submission contains a prudent and relevant mix of defense technology investments. This program is needed to produce a robust set of innovative technology options for tomorrow's weapon systems.

It secures the Department's long-term modernization strategy. It meets the national security needs of the Nation. And it preserves a legacy of technological superiority for the U.S. forces in the 21st century.

I thank you, Mr. Chairman, for the opportunity to appear before the subcommittee, and I would be happy to answer any questions you may have.

Senator SMITH. Thank you very much, Mr. Secretary.

[The prepared statement of Dr. Kaminski follows:]

PREPARED STATEMENT BY PAUL G. KAMINSKI, UNDER SECRETARY OF DEFENSE FOR ACQUISITION AND TECHNOLOGY

Mr. Chairman, members of the subcommittee, and staff, thank you for the opportunity to appear before you today to discuss the specifics of the Department of Defense technology base programs and how they support the Department's overall modernization plans and the war fighter's needs.

Mr. Chairman, you may have heard of the Department's studies of a "Revolution in Military Affairs" or RMA. The revolution derives not from a single innovation or idea but from a fundamental change in the way America fights. The revolution is driven by making full use of a wide range of new technology involving sensors, computers, low observables, precision guided munitions and telecommunications.

Today, I describe a vision of a second but related revolution—a "Revolution in Military Acquisition Affairs"—or RMA[2]. This revolution will change the way America develops and fields weapon systems. Like the first revolution, this second revolution is driven by capturing the synergism derived from the integration of multiple thrusts. In particular, we are making progress on three fronts: increasing our focus on life cycle cost reduction; making better use of the national industrial base; and implementing acquisition process improvements.

REDUCING LIFE CYCLE COST

The first component of this revolution is the Department's increased focus on life cycle cost reduction. The Department is shifting away from a world where performance is the only consideration and toward a more balanced "cost of performance" view. I am pleased to report that weapon system life cycle cost is being treated as an *independent* variable, not simply as a fall-out *dependent* variable.

As the Department's senior acquisition executive, I chair the Defense Acquisition Board (DAB) along with Admiral Owens who wears another hat as chairman of the Joint Requirements Oversight Council (JROC). Together, we have created a strong imperative throughout the Department to do the up front trades; assess the incremental cost of driving requirements; and find the knee of the cost-performance curve(s). Our objective is to insure that the Department's modernization and recapitalization plan continues to be built on a solid foundation of timely and explicit affordability decisions.

Our attention is not focused solely on the initial acquisition cost. We are concerned with overall *life cycle* cost. This emphasis is driven by the fact that 60–70 percent of most weapon system's costs are incurred subsequent to initial deployment of the system. To the extent the Department maintains systems longer, life cycle cost becomes a more important consideration. The message here is that "back end" sustainment costs are receiving more "up front" design attention. Where it makes sense, the Department will invest in reliability upgrades to reduce the ownership costs for existing systems. For new or existing systems, the payoff associated with these life cycle cost initiatives—in terms of savings to the Department's budget bottom line—will not be realized over the near term, but over the long term.

The Department's Science and Technology (S&T) program supports life cycle cost reduction for new and existing systems through investments in a number of supporting technologies. Some of the Department's more prominent technology thrusts for affordability include: improved modeling and simulation; advanced manufacturing processes; and embedded corrosion and fracture sensors. These technology investments are essential to maintain effective and capable platforms over increasingly longer service lives. The Department's projected force structure and budget requirements are related to service life assumptions supported by this S&T base.

LEVERAGING THE NATIONAL INDUSTRIAL BASE

The second component of our revolution is leveraging what's happening in the commercial industrial base. The Department is placing greater reliance on commercial sources to make DOD's weapon systems more affordable. This is a two-part proposition. The first task is to leverage commercial investment in technology development—that is the central theme of the Department's dual-use technology program. The second piece has to do with leveraging the commercial sector's capital investment in production facilities.

The Department of Defense is no longer the leader in pushing forward the investment base for many leading edge defense technologies. In aggregate terms, commercial industry surpassed the DOD in R&D spending back in 1965. The disparity between the DOD and commercial sector investment in R&D has been growing wider ever since. Commercial industry is now the technological agent of change in information systems, telecommunications and micro-electronics. The Department's dual-use technology program is tailored to leverage off the commercial technology base without having the taxpayer make the root investment.

The second piece of the equation, and here's where ARPA's Technology Reinvestment Program—TRP—plays a big role, is leveraging off the commercial production base. The Department is putting a great deal of emphasis on taking advantage of commercial production to manufacture defense equipment. If we can produce weapon system platforms on commercial lines, it will be more the exception than the rule. However, there is great potential for doing this at the subsystem and critical component level of assembly.

A good example is the Department's investment in an electronic packaging technique—it is called Multi-Chip Modules or MCMs. DOD was the early leader in advancing this technology. In 1990 and 1991, there was virtually no commercial market. The Department's current projections are that the market demand for MCMs will grow to several hundred millions of dollars by the turn of the century. This growth is driven by the demand of the commercial telecommunications and computer industry. By the turn of the century, the DOD percentage of that market will drop to about 10 percent of the total. As a result, the Department is able to buy off commercial MCM lines and capture savings in the prices DOD pays. I have no interest whatsoever in seeing a commercial capability developed if the DOD is not planning to buy off that commercial line to generate a net savings for the Department of Defense.

Mr. Chairman, I have been in my job now about 5 months. So, the TRP was not really invented on my watch. But I must say, that if it did not exist today, the TRP would be precisely the type of program I would be trying to establish to support this underlying strategy.

I am absolutely convinced that the benefits of a better leveraged industrial base are not only reduced cost, but shortened acquisition cycle times as well. The Department of Defense can not afford a 15-year acquisition cycle time when the comparable commercial turnover is every 3–4 years. The issue is not only cost. The lives of our soldiers, sailors, marines and airmen may depend upon shortened acquisition cycle times as well. In a global market, everyone, including our potential adversaries, will gain increasing access to the same commercial technology base. The military advantage goes to the nation who has the best cycle time to capture technologies that are commercially available; incorporate them in weapon systems; and get them fielded first.

IMPROVING THE ACQUISITION PROCESS

The real center of gravity for the revolution is an improved acquisition process. Progress along this front makes us more efficient; enables the DOD to purchase off commercial lines; and allows us to buy more with less. In general terms, I see improvements to the acquisition process proceeding along three tracks.

Track 1: Ground Work. The ground work phase, now behind us, was laid by Secretary Perry, Colleen Preston, the 103rd Congress and many others. It was completed with passage of the Federal Acquisition Streamlining Act (FASA) of 1994. This act provides an excellent foundation and is especially helpful in two small purchase categories—under $2,500 and under $100,000.

Track 2: Another Round of Legislation. The Department supports and applauds the 104th Congress' deliberations toward enactment of a second legislative package—FASA II—for relief from restrictive statutes not dealt with earlier. It will remove many important statutory impediments to efficient acquisition of large systems.

Track 3: Implementation. The Department has moved out smartly on regulatory changes to consolidate the gains made with enactment of the 1994 FASA legislation. To make the system truly responsive, we must "un-learn" some of the accumulated collective behaviors we have "learned" over the years. My immediate goal is to create a climate of reasoned, well informed risk-taking by our program executive officers and system program directors. I solicit your support to help me shift from an environment of regulation and enforcement to one of incentivized performance.

MODERNIZATION AND RECAPITALIZATION

Reduced costs and shortened lead times are the principal benefits of the "Revolution in Military Acquisition Affairs." This revolution supports the Department's long term financial plan. It will determine, to a large extent, what the DOD will spend on RDT&E, procurement, operations and maintenance over the Future Years Defense Program (FYDP) and beyond.

In the short term, Secretary Perry made the conscious decision to bring our total budget and force structure down while maintaining the high state of readiness needed to support increased operational tempos. During this transient period, the focus of the Department's modernization effort has been on those force enhancements essential to meeting the demands of this strategy. Science and Technology (S&T) efforts have been sustained, but overall procurement spending has been reduced to approximately 35 percent of the 1985 peak level. These actions are prudent in the near term, because past investments are adequate to sustain a force as it is being downsized.

Our current level of investment—it is a little over $39 billion in procurement and about $34 billion in RDT&E in our fiscai year 1996 budget submission—will not sustain the Bottom-Up Review (BUR) force over the long term. During the period of the current fiscal year 1996–2001 Future Years Defense Program (FYDP), the Department's investment focus must transition to a broad modernization and recapitalization effort. The objective of this effort will be to systematically upgrade and replace portions of the Department's capital stock. It is important to stress that the Department does not need to implement a one-for-one platform replacement of all current inventories. The Department's modernization and recapitalization program will be executed by:

- Injecting new technologies through service life extensions and technological insertions to modernize existing platforms1 systems, and supporting infrastructure;
- Introducing new systems and concepts that substantially upgrade U.S. war fighting capabilities;
- Replacing, on a limited basis, older systems on an in-kind basis without seeking to substantially improve or upgrade a given capability.

My principal responsibility as the Under Secretary for Acquisition and Technology is to work closely with the JROC to insure the Department fields effective, technologically superior weapon systems at an affordable cost. The future readiness and effectiveness of U.S. forces will be determined by today's investment in a relevant technology base. A suitable "technology ramp" must be in place before a robust procurement program can proceed.

TECHNOLOGY RAMPS

Today's leading edge systems were made possible through decades of investment in fundamental science and exploratory development work. The technology ramps initiated in the early 1960s and sustained in the mid-1970s gave us the stealth aircraft, precision guided munitions, and night vision systems that provided U.S. forces with a decisive combat edge during the 1991 Gulf war.

The Air Force's F–117 stealth fighter, one of the high-value strike weapons of the war, provides a good illustrative example of the need for stable, long term investment In key enabling defense technologies. The F–117 became operational in 1983—in ample time for the Persian Gulf conflict. However, the key enabling technologies for this system can be traced to a mathematical formulation of radar scattering geometries and the development of radar absorbing materials that date back to the early 1960s. During the 1970s, the Department's investment in 6.2 exploratory development produced new titanium alloys, better compressor seals, stealth nozzle designs and many other technologies needed for the Defense Research Projects Agency (DARPA) to build two HAVE BLUE prototypes—the proof of concept flight demonstration vehicles for what would become the operational F–117 6 years later.

To maintain the technological edge of U.S. forces, the Department must continue to establish stable and *sustainable* technology ramps for tomorrow's systems. The President's fiscal year 1996 budget submission contains $7.6 billion for the Department's 6.1/6.2/6.3 S&T programs (excludes BMDO S&T programs). Although the fiscal year 1996 amount is about $800 million or about 10 percent less than the fiscal year 1995 appropriated level, it returns the Department's investment in S&T to a more sustainable real growth profile over the long term—one more consistent with the historical norms established over the past 30 years. Budget authority for science and technology in fiscal year 2001 is projected to be 18 percent higher than in fiscal year 1996. More importantly, the fiscal year 1996 amount is the minimum level required to initiate a series of technology "on-ramps" that provide the foundation for meeting tomorrow's joint warfighting needs.

TECHNOLOGY PROGRAM

The Director of Defense Research & Engineering (DDR&E) is responsible for overseeing both the content and execution of the Defense S&T Program. Over the past year, the DDR&E developed and published the *Defense Science and Technology Strategy* and the *Defense Technology Plan* in conjunction with the Military Departments and Defense Agencies. Together, these companion documents provide a single integrated summary of the Department's overall S&T vision, strategy and program content.

In turn, each of the Military Departments and Defense Agencies organize and manage the execution of their individual S&T programs within this overarching framework. The resulting diversity in management approaches provides a robust capability and alternate methods for tackling emergent issues. All of these organizations, under the leadership of the DDR&E, work closely together to:

- Establish technology "on-ramps" that are responsive to the warfighter's needs;
- Review soundness of technical and programmatic approaches;
- Coordinate allocation of resources;
- Prevent duplication and overlap;
- Execute an integrated, comprehensive program;
- Guard against technological surprise.

The Department's technology "on-ramps" are a collection of individual technology programs in research categories 6.1/6.2 (basic research/exploratory development) and 6.3 (advanced development). These efforts are linked in a technology insertion road map to specific weapon system acquisition programs, either a new start or system upgrade, to satisfy the warfighter's stated mission needs. For example, the next generation of air-to-air missiles is supported by a broad range of Air Force, Army and Navy research category 6.2 exploratory development projects to develop improved seeker, warhead, fuzing and solid rocket motor component technologies. The path for insertion of these new technologies in an improved Advanced Medium Range Air-to-Air Missile (AMRAAM) is through a research category 6.3 advanced development program, typically an Advanced Technology Demonstration (ATD), to prove the feasibility and military utility of the approach selected.

The Department has established a new mechanism in research category 6.3, called an Advanced Concept Technology Demonstration (ACTD), to rapidly transfer technology to the users. ACTDs are user-oriented, even user-dominated. An ACTD is an integrating effort to assemble and demonstrate a significant, new military capability. It is based upon mature advanced technologies—at a scale size adequate to establish operational utility and system integrity. The demonstration is jointly implemented with the operational user and materiel development communities as key participants. ACTDs allow the warfighting user to:

- Evaluate the military utility of the technology before committing to a major acquisition effort;
- Develop concepts of operation for employment of the new technology;
- Retain a low-cost residual operational capability.

Military needs drive the direction and resource allocation priorities of the Department's S&T program. The Joint Staff and the JROC have identified five "Future Joint Warfighting Capabilities" most needed by the U.S. Combatant Commands for coping with the post-Cold War world. These five future warfighting needs are:

- *To maintain near perfect real-time knowledge of the enemy and communicate that to all forces in near-real time.* Warfighters need to know where the enemy is, what their capabilities are, where friendly forces are, and what range of actions each could execute. In addition, warfighters need timely information and intelligence products. Specifically, they require near-real time updates on meteorological, topographical, geographical, and political conditions. The Department's S&T program is emphasizing several promising advanced technology areas to achieve dominant battlefield awareness and action cycle times. Important technological advances are being pursued in: information surveillance, information management, and intelligence dissemination. The current family of Unmanned Airborne Vehicle (UAV) ACTDs and a fiscal year 1995–1996 ACTD new start on Aerostat Platforms are the 6.3 portion of a "technology ramp" aimed at improved airborne surveillance and reconnaissance capabilities. Three fiscal year 1995–1996 ACTD new starts are looking at innovative ways to decrease the action cycle time of U.S. forces by addressing the growing need to process, fuse, and then disseminate intelligence: (1) Semi-Automated Imagery Intelligence (IMINT) Processing; (2) Ground-Ground and Air-Ground Combat Identification; and (3) Battlefield Awareness and Data Dissemination.

To engage regional forces promptly in decisive combat, on a global basis. Prompt reaction to regional conflicts has two components: global mobility and decisive combat. Technological advances in aircraft propulsion have dramatically improved the performance of Air Force "global reach—global power" forces. The Department's 6.2/6.3 Integrated High Performance Turbine Engine Technology (IHPTET) program, budgeted at $134 million in fiscal year 1996, is aimed at providing a 100 percent improvement (over the 1987 baseline) in the thrust/weight ratio of high performance fighter engines by 2003. Substantial strides are being made in the Department's 6.2 exploratory development programs to reduce the weight of "heavy" Army and Marine forces so they can be sea deployable in half the time with half the ships.

To employ a range of capabilities more suitable to actions at the lower end of the full range of military operations which allow achievement of military objectives with minimum casualties and collateral damage. The principal challenge is to limit casualties and collateral damage. Advances in precision targeting and controlled destruction, particularly in settings where enemy combatants mingle with civilians, are required to limit collateral damage and casualties. The Marine Corps, Army and several CINCs are sponsoring an fiscal year 1995–1996 ACTD new start on Military Operations in Built-Up Areas (MOBA). This ACTD will serve as an integrating effort to demonstrate new operational capabilities in urban settings using mature and emerging technologies from the Department's portfolio of 6.2 projects on non-lethal weapons; surveillance; sensing, target detection and situational awareness.

To control the use of space. Desert Storm was the first space war. Space based systems provided coalition forces with communications, navigation, weather monitoring, threat warning, intelligence collection, and a decisive advantage in situational awareness. Technological advancements are required to insure space based communications links are jam resistant. Without assured access to and control of space, that advantage is lost. The Department has embarked on a wide range of space vehicle and booster 6.2/6.3 development efforts. The Air Force has budgeted $25 million in fiscal year 1996 to reduce the size and weight of the Extremely High Frequency (EHF) payload on board Milstar communications satellites. Current projections indicate that replenishment of the Milstar constellation with a considerably less costly Medium Launch Vehicle (MLV)-class Advanced EHF satellite is possible by 2006. A fiscal year 1995–1996 ACTD new start on Navigation Warfare will demonstrate an operational concept to deny enemy use of navigation systems (including the Global Positioning System) while assuring access to these same systems by U.S. forces.

To counter the threat of weapons of mass destruction and future ballistic and cruise missiles to the CONUS and deployed forces. Weapons of mass destruction, theater ballistic missiles, and anti-ship cruise missiles present a wide range of serious threats to U.S. forces. Technological advances are needed to allow for the better detection of and defense against biological agents. The Ballistic Missile Defense Organization has a robust ballistic missile defense technology program in place to counter validated threats. The Navy is sponsoring a "Mountain Top" ACTD to demonstrate over-the-horizon detection, tracking and engagement of cruise missiles from an elevated sensor suite. In fiscal year 1995–1996 ACTD new start on Counter Proliferation will demonstrate an improved counter force capability to survey and strike weapons of mass destruction (WMD) storage and production facilities, including the planning tools for predicting collateral damage and performing bomb damage assessments.

CORE CAPABILITIES

About 70 percent of the Department's S&T Program is contracted out to industry and universities. The remaining 30 percent funds in-house research and development at the Defense laboratories. and test centers. The expertise of this in-house cadre is essential to protect the core buying and planning competencies within the Department.

SUMMARY

Mr. Chairman, every weapon system in the U.S. inventory today required decades of direct investment in critical enabling technologies. These systems exist because of the technologies and concepts developed by teams of dedicated researchers at our universities, defense laboratories, test centers and industrial contractors. The DOD is committed to maintaining a legacy of technological supremacy at an affordable cost.

The Department's fiscal year 1996 budget submission contains a prudent and relevant mix of defense technology investments. This program is needed to produce a robust set of innovative technology options for tomorrow's weapon systems. It secures the Department's long term modernization strategy; meets the national security needs of the nation; and preserves a legacy of technological superiority for U.S. forces in the 21st century.

I thank you for this opportunity to appear before the subcommittee and shall be happy to answer any questions you may have.

Senator SMITH. Dr. Jones, do you have any comments you wish to make, opening remarks?

Dr. JONES. No, I do not, Senator. Thank you.

Senator SMITH. Mr. Secretary, one of the trends in the defense budget in the science and tech program is this relative shifting of more funding into OSD accounts, basically at the expense of the services.

Can you give us some background as to why this is happening? Is this intentional, or is it just accidental or by design? What is your, briefly——

Dr. KAMINSKI. Yes, Mr. Chairman, I can. I think the principal reason for that has to do with the budget associated with the Advanced Research Projects Agency (ARPA).

Do we have a copy of this slide? I think a graph is worth 1,000 words here. This is not numbered, Bob, but it is at the back of my—okay.

Let me see if I can describe this chart, Mr. Chairman, since we do not seem to have the viewgraph.

What the chart shows is that in 6.1, 6.2 and 6.5, the ARPA budget has remained relatively constant. But in the 6.3 account, the ARPA budget, which was about $400 million in fiscal year 1986 through 1988, has grown to about $1.8 billion in fiscal year 1994. Do you see that dash line which represents 6.3?

In fiscal year 1993, that was a major congressional add. This add, though, includes programs such as the TRP, which is responsible for about half of this. Plus there are other components.

So the main thrust has been in the 6.3 budget line, Mr. Chairman. And that has been intentional for the reasons I described.

Senator SMITH. Do you have in place some assurance that this movement into OSD is not going to affect the needs of the actual warfighter?

Dr. KAMINSKI. I believe we have in place, and we will probably be taking some steps to shore up this base even further to be sure that the needs of the warfighter are reflected.

For example, in our TRP program, we will be moving to have service priorities considered and heard as we establish the categories for our program in fiscal year 1996. And, in fact, there are boards that exist to supervise execution of the program as well.

This is based on the fact that several of these programs, for example, are underlying programs in electronics and in packaging. They impact all of the services in their needs. Those needs have a common core, and managing pieces of this centrally makes sense to me.

Senator SMITH. So just for clarity, you said that most of this was ARPA, most of the reason for that. So you can say, then, that this is not an attempt to move control of these programs from the services to OSD.

Dr. KAMINSKI. Certainly the execution is overseen by OSD. But the issue here is making sure that the service interests have been considered in the formulation of these programs, their objectives. That piece is not going away.

I would also say, back on the execution, that some considerable percentage of these programs actually do end up being executed by service components. Some of the contracting is done directly in OSD, but some is transferred to the services for execution as well, Senator Smith.

Senator SMITH. Well, you mentioned in your testimony, you talk about the on ramps as a collection of individual technology programs in research categories 6.1, 6.2 and 6.3, both the basic research, the exploratory and the advanced development, as tomorrow's programs.

But all of those accounts in the respective services in general have been cut or reduced. So how do you justify preparing for tomorrow's programs with the essential—either if it is not a plus up or it is at least maintaining stability in the infrastructure line, but cutting on those 6.1, 6.2, 6.3 programs, cutting back in the respective services, some more than others?

The Army, for example, took the biggest hit. I mean, how do you justify that action and at the same time say we are preparing for tomorrow's programs?

Dr. KAMINSKI. How do we justify maintaining the infrastructure while——

Senator SMITH. No. How do you justify, where you say, talking about the on ramps leading into the next generation of programs, "Collection of individual technology programs and research categories basic to exploratory development and advance development, these are linked in a technology insertion road map to specific weapon system acquisition programs, basically for tomorrow's programs"?

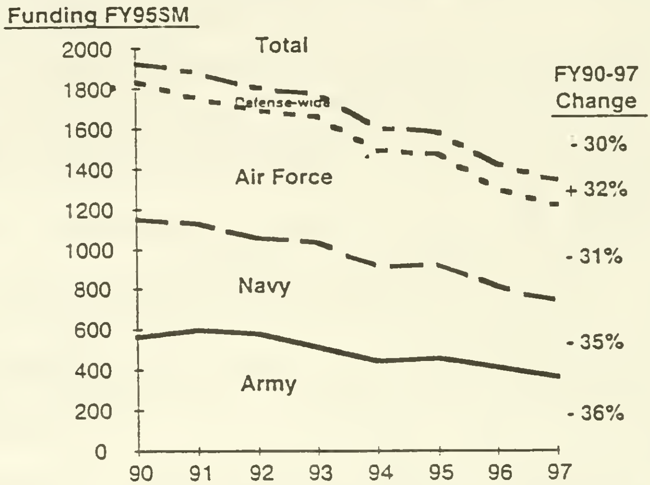
That is your statement, but in reality 6.1, 6.2 and 6.3 are being reduced, dramatically reduced, I think, while most of the roughly $1 billion in reductions from the program are from those accounts.

So my question is: How do you justify saying that we are preparing for tomorrow's programs, as you talk about with the on ramps, and at the same time dramatically reducing in the respective services those programs, while you are plusing up OSD?

You gave the reason for the OSD plus up, but I am just concerned about the other side of it, where the warfighters are going to be, the service programs that are closest to the warfighter.

Dr. KAMINSKI. I understand. Over—let's see. Can we look at backup slide eight?

T&E Inrastructure & Investment Trends RDT&E Funded Facilities*



* Defense-wide includes DISA T&E Facilities & cent rally funded T&E investment for joint service use

This shows the funding for RDT&E funded T&E infrastructure. This is total RDT&E for each of the services and for the defense-wide piece. And I believe you can see, just as you stated, Mr. Chairman, that there has been a growth in the OSD, in the defense-wide piece of that program, principally for the reason I stated in this growth in the 6.3 account, while the other services' accounts have declined somewhat.

Now, this is the overall RDT&E funded T&E infrastructure budget. It has declined by about a third over this period of time in consonance with the overall reduction in the budget. S&T lines that we are talking about have declined a smaller amount. I do not have those by service.

Senator SMITH. Well, I did not round this off. I mean, I rounded this off, but it is roughly $1 billion—I think it is a little less than $1 billion—in overall reductions from the approximately $10 billion from last year. Seven hundred million or $800 million are your reductions.

What are we losing? What activity? What activity that would be in support of the warfighter are we losing? I guess to put it in a fair way, what are we losing as a result of that $700 million or $800 million?

Dr. KAMINSKI. The entry ramp that I talked about is a narrower entry ramp now with the smaller program. There is a less robust base underpinning each of the service efforts than there would be otherwise.

Senator SMITH. But, I mean, that goes back to my original question, when you said it narrows the ramp, the entry ramp, because you really do not say that in your statement.

You say the Department's technology on ramps are a collection of programs, and these efforts are linked in a technology insertion road map. There are specific systems.

You kind of indicate that this is—you mention a number of those systems. But really, you are narrowing that ramp is what you are saying.

Dr. KAMINSKI. Yes. With less funding, the ramps are narrower ramps than they would otherwise be.

Senator SMITH. The question is, though: Where those ramps are being narrowed in the war fighting, to the warfighters, is there justification somewhere else to take money; whether it be TRP or something else?

Is there some other justification for taking money rather than from those on ramps? That is my question.

Dr. KAMINSKI. Really, the underlying issue, I think, is that, as ARPA funding is increased: Is that sensible given the other programs are decreasing?

Senator SMITH. Well, maybe we can—I can talk specifically when the respective services come up, so you will know basically the same point, as to where you all feel these are being cut, these on-ramps.

Dr. KAMINSKI. I do feel we have a balance piece here. There is no doubt, though, with smaller programs in the services, the service ramps are smaller. They are less broad ramps than they would otherwise be.

Senator SMITH. My only point is: Is it the ramps we want to be cutting? Is there something else within the $10 billion framework that deserves a hard look, as a committee here, before we go down that road?

Dr. JONES. Senator Smith, I think a way of looking at it is, as Secretary Kaminski has said, we are funding these on-ramps in the technologies that are important. We continue to have a broad-based program.

I think you will not find that some large area is wholly cut out. There is some less funding in some specific areas. And I think both in OSD and in the services, very hard tradeoffs were made in the face of a declining budget.

The Secretary has placed very high priority on readiness and on quality of life. We do not believe that the program has been reduced to a debilitating extent. We have just made some smart tradeoffs as the budget permits.

Senator SMITH. Thank you. Senator Bingaman.

Senator BINGAMAN. Thank you, Mr. Chairman.

Let me just follow up on Senator Smith's line of questioning, because what I understand—and just tell me if I am wrong about this.

But my understanding is that more and more of the technology needs that we have for our defense purposes are in these areas, such as electronics and sensors and communications. Those are the—that is where the real advances are being made.

And much of that technology research and development is not specific to a service. It is—in fact, it is not even specific to DOD. That is why you are pursuing dual use strategies with industry.

So as the emphasis shifts from defense specific to more generic technology development, and as you concentrate more in these areas, it is natural that more of the funding is gravitated toward the Department of Defense generally.

Is that a fair——

Dr. KAMINSKI. The underlying premise is exactly right, that as the electronic content of our systems goes up, we would be expecting to get more leverage from our science and technology investments in those electronic components.

They largely go across the Department with similar interest by all the services. With the degree of freedom which one has here, one could give this program to a service to conduct, make it executive agent for the whole department, or put it in an organization like ARPA.

We have chosen to do the latter. Either way, the impact is the same. It is across the whole Department.

Where you ended up putting it for execution would effect how this budget is displayed; that is, whether more or less is in the services vis-a-vis ARPA. Our choice was to put it into ARPA. But your underlying premise, Senator Bingaman, I agree with completely.

Senator BINGAMAN. Let me ask you: I think you have described in good detail your thoughts on the value of some of these dual use programs that we have tried to support at ARPA and the value they have for defense needs long term. Let me ask, though, about this other infrastructure, this test and evaluation infrastructure.

It does not seem to me, as I look at the proposed budget, it does not seem to me that the same kind of cost reductions have occurred there that have occurred in some of the other areas.

Am I missing something there? I mean, I know that there is some cost cutting, but it does not seem to me it is near as extensive as it would be expected to be in a rational world.

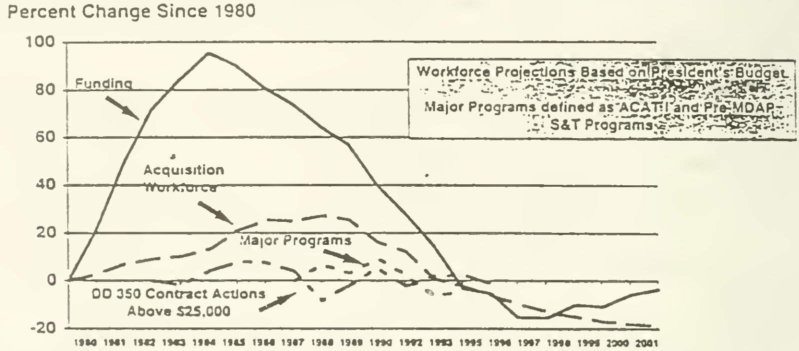
Dr. KAMINSKI. Senator Bingaman, I think you are right. The cost cutting there has not yet happened to the same degree that it has in other areas. However, the plan need program does end up taking proportional cuts in those areas. But what you will find, looking at the details, is that those cuts are planned in the program.

If I may, I would like to illustrate that with a chart or two.

Senator BINGAMAN. Sure.

Dr. KAMINSKI. Could I have backup chart six?

Trends in the Acquisition Workforce



TRENDS FY 80 TO FY 01
FUNDING–3.2% Decrease PEOPLE–20% Decrease WORKLOAD–Relatively Fla

This first one relates to some questions asked very early in my job. Let me explain this complicated curve. The percent change is shown on the left axis there with zero indicating the baseline in 1980, and then we are plotting versus years to the right.

The middle curve—this curve deals with the infrastructure associated with our acquisition work force. The top curve shows our investment funding versus time.

So starting from whatever level it was in 1980, it went up to a peak that was about 90 percent higher in the mid-eighties and has today, in constant dollar terms in 1996, dropped about, as I read the curve, 10 to 12 percent below that base in 1980.

Now with respect to infrastructure, the next curve on the chart shows our acquisition work force. It increased by about not quite 30 percent in the late 1980s over where it was in 1980.

One of the immediate things you see looking at this curve is the size of our infrastructure lags the budget; that is, the acquisition work force peaked about 4 years after the peak in the acquisition budget.

You can see now that the acquisition work force is being brought down. It is smaller now than it was in 1980. But if I look again at the 1995 figure, it is about 5 percent below what it was in 1980.

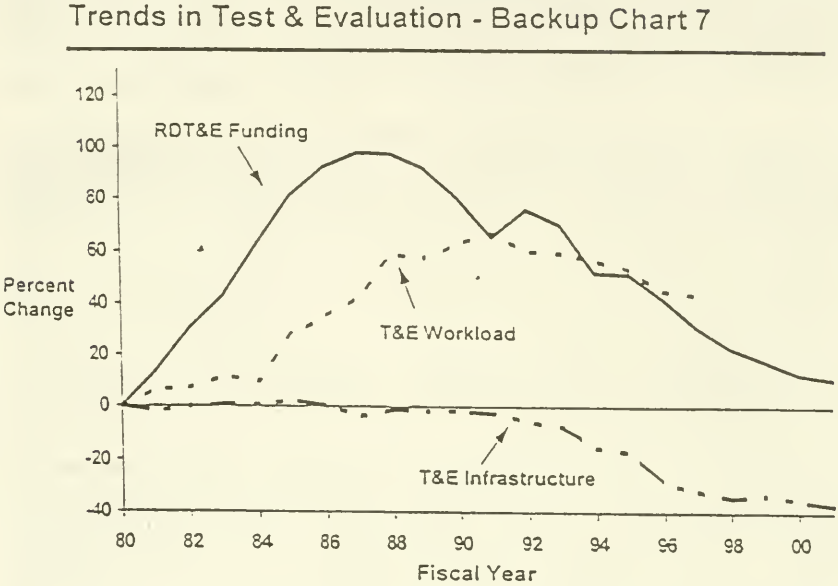
It is about 30 percent below what it was at its peak. And it is intended to go down to a value that is about 20 percent below what it was in 1980.

So it is being reduced. It is being reduced in a commensurate way, but there is a time lag in the reduction. It has not been reduced as rapidly as other components of our budget.

Senator BINGAMAN. Okay. I have always expected that simulation technology would allow substantial cutbacks in test and evaluation facilities. Is that right or wrong? It does not seem to be reflected in the budgets you have given us so far.

Dr. KAMINSKI. I think it should have some impact on reduction of test and evaluation activity and facilities. I have a similar chart to this one on our test and evaluation program, although I would say that I have less certainty about some of these numbers in terms of how they are measured.

May I have backup chart seven, please?



This is the same kind of chart, Senator Bingaman. It shows three different things plotted with respect to a baseline that was established at the 1980 level. The first figure is DOD RDT&E, that which you would be expected to impact the testing.

The next curve shows something labeled "T&E workload," and I would say that is an arbitrary label. What is really plotted there was the funding expended for test and evaluation (T&E) to the extent that that is a measure of the workload.

And then the bottom curve shows the test and evaluation infrastructure. And what that shows is the same kind of tendency I showed earlier.

While the RDT&E has come down substantially by 1995, our T&E infrastructure is only down about—it is like about 15 percent. It is planned to be taken down to below 30 percent of that baseline level, but it does not achieve that until 1997. So it is lagging, also.

Senator BINGAMAN. Yes. I have just been concerned that it did not seem to me that this BRAC process that we set up has resulted in much reduction in infrastructure and testing and evaluation.

I had thought this round of BRAC would cause some of that occur. There is darn little of it in there, as far as I can tell.

Senator Smith is pointing out that there is one base in there. I remember in this room a hearing about 10 years ago with Secretary Weinberger—in the published statement of the President's budget, they took great credit for consolidating or eliminating a sled track at China Lake.

They were going to consolidate that into the sled track at Holloman Air Force Base in my State. So I took great interest in that and asked him some questions about it.

He said this was a great cost saver, and they were going to get right on that. Well, they are still working on it, as far as I can tell. [Laughter.]

So I have become skeptical about reduction of inventory in this area.

Let me ask about university research. I guess the—my understanding is that historically the way things have developed since World War II, at any rate, the lion's share of government support for university research has come out of the Department of Defense in many key areas.

I am concerned that we not abandon that commitment, because I think the long-term implications for our defense capability would be very adverse if we did.

If you have any comment on that, I would be anxious to hear it.

Dr. KAMINSKI. Senator Bingaman, I agree with you completely. The underlying base provided in our universities is very critical to this technology underpinnings.

As I indicated back with the Stealth Program, some of the underlying algorithms that were used for computation of radar cross-section, for computation of the aerodynamic properties and computational fluid dynamics had their roots in university mathematics. And the DOD has been a principal sponsor of that base through the years.

I would point out that that base is valuable in two ways. It is valuable in terms of the technology that is produced and put on the shelf.

But it is valuable in another important way in terms of trained and experienced people, who we can bring to bear on the problem, when we have a problem develop sometime in later years. And that is sometimes forgotten.

One of the real resources is building that base of skilled people that we can bring to bear when problems arise. So I am a strong supporter of that underlying program.

Senator BINGAMAN. My time has expired. Thank you very much.

Senator SMITH. Before we go, just a bit of a follow-up: Maybe I am just having difficulty understanding the point here, Mr. Secretary, but would you define ARPA or some of the funding in ARPA as on-ramp technology?

Dr. KAMINSKI. Yes, I would.

Senator SMITH. How much of it?

Dr. KAMINSKI. I would say that the preponderance of the program in ARPA is on-ramp or enabling technology. There is a piece involved in new concepts. There is a set of technology associated with manufacturing efficiency. I do not have a breakdown of the ARPA program and its categories——

Senator SMITH. A rough percentage.

Dr. KAMINSKI. But I will supply that for the record.

[The information follows:]

ARPA FISCAL YEAR 1996 "ON-RAMP" TECHNOLOGY FUNDING

Approximately 90 percent of the Advanced Research Projects Agency's (ARPA) fiscal year budget request funds on-ramp technology research. These efforts are developing the underlying technology necessary to manufacture and field next generation weapon systems and training devices. In fact, the only ARPA programs that are not on-ramp technology efforts are SEMATECH consortium support, Advanced Lithography research, comprehensive Test Ban Treaty monitoring activities, Focus: HOPE support, U.S./Japan Management Training, ARPA management headquarters support, the JASON project, and small Business Innovative Research set asides.

Senator SMITH. There is some dual use in there.

Dr. KAMINSKI. Some dual use component and some of the dual use technology is not on-ramp in a sense in that it is enabling the ability to package things in smaller spaces, like that MCM board that I showed, that would enable us to put a capability imbedded in the weapon system that we otherwise would not be able to package.

So it is not enabling in a concept, but it is enabling in terms of what we can package.

Senator SMITH. Well, let me—this is where—I am going to speak for myself, where I need some help. As you are well aware, both from the House and then there was a vote on the Senate floor, the entire TRP program is under siege.

Dr. KAMINSKI. Certainly.

Senator SMITH. And I think you will notice that most, if not all, of the members of the Senate Armed Services Committee did not vote to line that out, but most members.

But I think what I am getting at is: As I look at the numbers on your fiscal 1995 versus fiscal 1996 numbers, I see essentially a very, very small decline, in any, in infrastructure numbers. I see a sharp decline in the 6.1, 6.2, 6.3 accounts, which, by your own admission is the on-ramp technology.

I find an inconsistency there. If you are telling me that that is not exactly accurate because if you put the ARPA numbers in there, it balances it out, then I have less concern.

But if you are not, then I have great concern, because we still have to look into that TRP program because you are recommending $500 million in the TRP program.

And you are taking down dramatically the 6.1, 6.2, 6.3 accounts, while at the same time, you are saying, "Let's move forward with the on-ramp technology for the weapons, the war fighting weapons, of the future."

So I just want to be clear what you are doing here, so that we can wrestle with this. I mean, it is very important. I think I speak for most of the committee on this, because we are really getting hammered.

And if there is a case where some of this dual use technology in the TRP or in the ARPA program is not necessary or maybe lesser on the scale than maybe some of the on-ramp future technology for our warfighters, then I think we have to look at that.

But the way it is presented, at least as I see it, the preliminary—it is only a preliminary look at the numbers—is the opposite. It is saying TRP is fully funded. The on-ramp technology is not fully funded.

And you are basically making a priority out of one over the other. And I need a better explanation or a better handle on that.

Dr. KAMINSKI. With respect to that priority, I believe the Department's priorities are properly placed in what we did in the 1996 program that we brought forward. That is, I believe there is a leverage to be derived from this TRP program.

Senator SMITH. So you support those priorities, but I would just point out to you that about $700 million of that is directly out of the 6.1, 6.2, 6.3 on-ramp technology programs. That is where it is coming from.

It is not coming out of infrastructure. It is not coming out of TRP. It is not coming out of OSD. It is coming right out of there.

Dr. KAMINSKI. I understand, and I believe this technology has the same underlying leverage as the programs that we had in the services' 6.1, 6.2 and 6.3 budget. It has leverage in two senses, Senator Smith.

One is getting the Department to operate on a more commercial-like basis, not only exploiting the commercial technology developments but operating more off the commercial production lines.

It requires that we change our culture, and I believe we can get just as much leverage from that program, or more so, than we would have gotten in the underlying 6.1, 6.2, 6.3 programs that we had in the services. That is why we budgeted in that way.

Senator SMITH. But every program, every account, every item in the TRP program, all of them, any of them that you pick, if we were to just reach in and pick one out of the bag, would have a priority in all cases over the 6.1, 6.2, 6.3 accounts that you have reduced. Is that what you are saying?

Dr. KAMINSKI. I believe so in general. I think these priorities, though, sometimes are a little hard to assess, because this relevance can be 10 or 20 years into the future.

I once had a discussion with a CEO of a company, who gave instructions to his chief technology officer that said, "Invest only in the technologies that are going to pay off."

And if I could ever find such a person who could perfectly pick what was going to pay off, I would put him to work. So these issues come down, Mr. Chairman, to judgmental decisions about where the payoff lies.

I would also say that one of the inherent advantages in this base of TRP programs, if not done to excess, is there is matching contributions by a commercial participant. So it is not just the DOD dollars that are going into this. It is a one-for-one leverage from the commercial base.

But once again, we have to make an assessment based upon return to us overall. The TRP is more oriented to leveraging off a commercial base than some of our internal programs.

Senator SMITH. Well, let me just finish on this point, and then ask Senator Bingaman to come back for any further questions that he might have.

There is a lot of pressure on the technology base programs, because we are trying to address short-term readiness here. And we understand that. It is a limited budget.

We have to address the short-term pressures. And I am willing to give that the administration is trying to do that and carefully weighed that.

But what I am concerned about is that we may get reductions forced upon us that we may not like, and without the knowledge, then we cannot ask responsibly. This is critical.

I mean, we are looking at two key areas here, short-term readiness, which we have to deal with, of course, but also the future. I mean, you—I think it was you. If it was not your statement, I apologize.

It was either yours or one of the other witnesses, who said—who talked about how we focused in the sixties and seventies on the programs that produced—and it was very elaborate testimony—produced the weapons that we used in the Persian Gulf.

Well, the technology that we may be scrapping in the 6.1, 6.2, 6.3 accounts here could very well be the technology for 2010 or 2020. And I just wanted—we have a responsibility here to look very carefully at that.

I mean, it is very easy to say it is all pork. We cannot identify, you know, what is going to be wasted. And you are correct. I agree with you. These programs are very risky.

We do not know all the facts from the start. Sometimes we win; sometimes we lose. And we understand that. That is why we take that risk when we fund them.

We do not want to hold you to a higher mark or standard there than you can do, but I just want to be prepared as much as possible when it comes.

And somebody—it may come again on TRP or dual use or some program out there that may or may not be, should not be, in the defense budget, where the so-called on-ramp technology, which you focus on and emphasize in your statement and in your budget, but the budget numbers, in my opinion, do not back it up. That is my concern.

Dr. KAMINSKI. I agree completely with the importance of this whole science and technology base——

Senator SMITH. But you stand by the numbers.

Dr. KAMINSKI. I do stand by the numbers.

Senator SMITH. I mean, that is what I am—that is an inconsistency that I cannot—I do not see that. Maybe you could provide me some further information.

Dr. KAMINSKI. Let me try it another way. I think maybe our fundamental difference of view is the following: Can you get as much leverage out of the programs that are in ARPA as we have in the services? And I believe you can.

I believe the essential core programs that we have in ARPA and the principal leading programs in the TRP have leverages generally across all the services.

Senator SMITH. That has grown, though, from $1 billion to $2.5 billion over the last few years, that whole program.

Dr. KAMINSKI. It has. I think one has to be careful about things that grow too fast, so that you do not get your priorities out of line. So that is something that is worth some careful scrutiny.

When big adds are made suddenly in areas, that is something you want to look at very carefully, because this S&T work is seed corn. It is the thing that our future is built on.

And there is a base here in which you are dependent upon the critical people skills that you cannot jack up or take down overnight. So you are right to be skeptical and have a careful look at where things have grown in a major way.

Senator BINGAMAN. Mr. Chairman, let me just follow up on your question to be sure I have the facts. I will not be able to ask the second panel these same questions.

But as I understand the budget that has been submitted to us, the real significant declines in funding in the 6.1, 6.2 and 6.3 accounts are in the Army, much more than they are in the Navy and in the Air Force.

When you look at the Navy, the figures that I have here, fiscal year 1995, it was 417, and it goes down to 402. Then 6.2 is from 511 to 478. And 6.3 is 539 to 500, I think it is.

The Air Force also shows some decline, but not dramatic decline. Now, the Army does show dramatic decline, particularly, I would say, in the 6.2 and 6.3 accounts. I would be interested in knowing if there is some particular reason.

I am also concerned that the Army is devoting a very small percentage of their budget to research and development. I think you have spent about—what is the figure?

About 7 percent of the Army's budget is devoted to research and development, whereas the Navy's is 10.8 percent. The Air Force's is 17.4 percent, OSD's is 22.8 percent.

I guess I would be concerned that the Army seems to be out of step with the other services in this regard, and the cuts in the Army research and development accounts seem very substantial in the budget you have submitted to us.

Do you have any explanation for that? Is there something going on here that we just are not aware of?

Dr. KAMINSKI. I would comment first on the OSD account. The reason you see that very high percentage in the OSD account is that it really is not follow-on transition procurement programs in the OSD account. So what you are seeing principally is ARPA, which sticks out.

On the question of the Army S&T program, my own opinion is that that is at the very thin edge of what is required to maintain the seed corn, and I would like to see a more robust program there. This is at the very edge of what is required to sustain the base in the future.

I would say again, though, if you look at key leveraging efforts in the Army for the future, the digitized battlefield effort, that is highly dependent upon electronics, inserted in an applique sense to begin with and in the full system sense in the long term. And this program can leverage off the OSD ARPA program that I spoke about earlier.

Senator BINGAMAN. That is all I have, Mr. Chairman.

Dr. KAMINSKI. Dr. Jones might like to respond.

Senator BINGAMAN. Certainly.

Dr. KAMINSKI. Be my guest.

Dr. JONES. Senator, I think you see some real differences in percentages. I think you are looking at the R&D numbers. So it includes not just science and technology, but the new systems development.

And you see in both the Navy and the Air Force, large systems at that stage, the new attack submarine under design, the V–22, the F–22, and I think there is a much less comparable Army program at that stage.

Senator BINGAMAN. I see.

Dr. JONES. Part of the difference is the percentages.

Senator BINGAMAN. Okay.

Dr. KAMINSKI. Mr. Chairman, if I may, there was another piece of the question you asked me earlier that I did not answer, and that was the infrastructure piece, the 6.5 piece. We continue to need to keep the pressure on that to bring that down in consonance with the rest of the cut we have taken.

As I showed you earlier, we are lagging. We are on a path to the right end point, but we need to maintain our program to have that infrastructure reduced to its fair share over a period of time. We are not there yet, but we are on a course to get there.

Senator SMITH. All right. I think that is everything for this panel. We appreciate your coming. Thank you very much.

Dr. KAMINSKI. Thank you.

Senator SMITH. Now we will go to panel number two.

We have, with the second panel, Hon. Gilbert Decker, Assistant Secretary of the Army for Research, Development and Acquisition; Hon. Nora Slatkin—did I say that right——

Ms. SLATKIN. Yes, sir.

Senator SMITH. Assistant Secretary of the Navy for Research, Development and Acquisition; Hon. Clark Fiester, Assistant Secretary of the Air Force for Acquisition.

We went a little longer in the first panel than I had intended. If you could present your statements for the record and briefly summarize in seven minutes or less, it would be appreciated. And then we could—we have a huge panel here of two Senators that have some questions for you.

The questions will be along the lines, I think, at least from my perspective, of what we asked before.

Why don't we go ahead? Who is first, the Army or——

Mr. DECKER. I guess we go in age order, both in longevity of service and probably chronology.

Senator SMITH. Okay.

STATEMENT OF HON. GILBERT F. DECKER, ASSISTANT SECRETARY OF THE ARMY FOR RESEARCH, DEVELOPMENT AND ACQUISITION

Mr. DECKER. Thank you, Mr. Chairman and Senator Bingaman. I really appreciate the opportunity to be here and give this subcommittee answers to your questions.

I do have a prepared statement I submitted for the record. I have a few comments and I promise you I will make them brief.

Our Army is a premier land force in the world today. We have the finest soldiers, equipped with the best war fighting equipment in the world.

And there is a lot of life left in the equipment and platforms. They were way out ahead when first fielded, and they still are.

So our first and foremost strategy is to leverage previous investments through technology insertion, and we believe we are having great success with this approach.

Some examples are the M1/A2 tank and M2/A3 Bradley upgrades, the Apache Longbow power control radar and Longbow Hellfire missile upgrades, the Patriot Advanced Capability-3 upgrade that gives us a stronger theater missile defense capability; the Paladin 155 millimeter howitzer upgrade; the Breacher combat vehicle and the Improved Recovery Vehicle.

Because we have critically constrained resources, the Army has had to balance readiness, quality of life, and modernization. As many of you have heard from Dr. Perry in prior testimony and other speeches, we have a 2-year modernization pause.

This is because he and the entire tri-service leadership is committed to readiness and quality of life for our soldiers, sailors, airmen and marines during the forced draw down in the periods of instability. This creates a severe problem in trying to prioritize an already thin modernization and science and technology (S&T) budget.

During these efforts, the Army has had to make some tough choices on the modernization and S&T fronts. Among them are, as you pointed out, modest reductions in our RDT&E programs. I believe you think they are severe, and I hope I can clear up some of the confusion when we discuss it—reduction in our tactical wheeled vehicle program; reduction in our ammunition program, where we have a severe mix problem; reduction in our tank program; reductions in our sustaining base automation and information systems program; and reduction in a larger-than-desired list of smaller critical programs.

We were also directed by the Office of the Secretary of Defense (OSD) to delay production in fielding beyond the 6-year Future Years Development Plan (FYDP) period of the Comanche armed reconnaissance helicopter, which I consider our number one priority.

The result is that this year's budget request continues to fund a limited, but critical, number of new weapon systems that compliment our technology insertion upgrade programs. Among them are Comanche; the Advanced Field Artillery System, Crusader; the Javelin fire and forget infantry-based anti-tank missile; the seek and destroy advanced capability armor-destruction missile fired out of the 155; the All-Source Analysis System block three, critical to our targeting and intelligence on the battlefield; and the Army Tactical Missiles System/Brilliant Anti-Tank (ATACM/BAT) program.

How will we pull this off? We are trying to stick to the following strategy: Use an efficient technology base in conjunction with acquisition reform to enable us to acquire as much as we possibly can from the broad industrial base of the country, not just the specialized defense base. Dual-use must be made a reality and not just a good idea.

Implement a horizontal technology integration program for digitization and technical architecture where new technologies are commonly inserted across several systems.

This area has, as its total foundation, information and communications technology, and our S&T programs are heavily prioritized in those technologies.

We must continue acquisition reform with a vengeance and realize at least a portion of the 20- to 30-percent savings that numerous studies show are possible with aggressive management and streamlined procedures.

And we must, after the modernization pause, plow back the outyear savings into modernization, just as Dr. Perry proposed in his February 10 testimony to the Senate Budget Committee.

It is a tough environment, and we, certainly I, appreciate the horrendous problems that you, our elected representatives, are faced with in trying to balance the fiscal and monetary equation.

At the same time, we cannot let our forces fall too far, and we cannot pause our modernization for too long a period.

My bottom line is that today's modernization programs are clearly tomorrow's readiness. Thank you.

Senator SMITH. Thank you.

[The prepared statement of Mr. Decker follows:]

PREPARED STATEMENT BY HON. GILBERT F. DECKER, ASSISTANT SECRETARY OF THE ARMY FOR RESEARCH, DEVELOPMENT AND ACQUISITION

INTRODUCTION

Mr. Chairman and members of the committee, thank you for the opportunity to appear before you to discuss the proposed fiscal year 1996 technology base programs for the United States Army. It is a privilege for me to represent the Army leadership, the civilian and military members of the Army acquisition work force, and the soldiers who rely on us to provide them with world-class weapons and support equipment to deter conflict or to fight and win our Nation's wars decisively with minimum casualties.

Today's Army is the premier land force in the world. We take great pride in knowing that our soldiers have the most technologically advanced warfighting systems. This would not have been possible without the help and support from members of this committee. As representatives of the American people, you have strongly supported our programs and guided them to fruition. I believe the Army has been a good steward of the resources provided, but our success would not have been possible without your advice and support.

It is imperative that we sustain modernization. If not, our technological advantage over potential adversaries will diminish over time and increase the risk to our soldiers. We cannot let this happen as we change today's Army into a 21st century Army—Force XXI. Continuous modernization is one of the keys to dominance on the future battlefield and the key to readiness for unexpected challenges of the 21st century.

We have made very tough choices because of our declining budget. In fiscal year 1996, the Army research, development, test and evaluation (RDT&E) budget request of $4.44 billion totals 12.9 percent of DOD's RDT&E budget request of $34.33 billion and about 7 percent of the Army's total budget request of $59.5 billion.

Our RDT&E budgets have not suffered the same level of declines as our procurement accounts; nonetheless, they have declined. We are seriously concerned about long-term modernization. The Army Chief of Staff, Gen. Gordon Sullivan, has stated that our soldiers dominate the battlefield today with weapons that were conceived, in some cases, before they were born. He said, "The trained and ready Army we have today is the fruit of two decades of investment by the citizens of this Nation." After a decade of decline, our modernization accounts are at the minimum.

Readiness is our number one priority, but we must not overlook the fact that a stable investment in modernization will ensure the long-term readiness of the force. Without question, today's modernization program is tomorrow's readiness. The delicate balance between the demands of readiness today and the need to invest in the future has been maintained in the past, but as we complete downsizing and restructuring the force, modernization programs are absolutely essential. Our actions this year and the next will influence the readiness of the force for the next 10 to 20 years. Should the Army be provided any additional resources, modernization must receive the highest priority.

The Army science and technology (S&T) fiscal year 1996 budget requests funds for: the experimentation and formulation of the 21st century Army, Force XXI; development of the requisite technologies for Force XXI modernization to ensure that we are ready when the Nation calls; avoiding technological surprise; and support of the Defense S&T Strategy and the Joint Chief of Staff's Future Joint Warfighting Capabilities mandate.

ARMY MODERNIZATION

JCS Pub 3–0, Doctrine for Joint Operations, establishes the fundamental principles, concepts, and doctrine for the Armed Forces of the United States in joint operations, as well as the doctrinal basis for U.S. military involvement in multinational and interagency operations. As the Nation's strategic land force, the Army must be prepared to respond rapidly to operations other than war and regional crises while minimizing risk against future uncertainties. If deterrence fails we must win decisively and swiftly, with minimum casualties.

U.S. Army FM 100–5, Operations, reflects Army thinking in a new, strategic era. It recognizes that the Cold War has ended and that the nature of the threat, and thus the strategy of the United States, has changed. FM 100–5 describes the principles of war; the dynamics of combat power; considerations of force projection; and fundamentals and characteristics of the offense, the defense, logistics, and operations other than war. Training and Doctrine Command (TROC) Pamphlets 525–5, Force XXI Operations, and 525–66, Operational Capability Requirements, forecast 21st century warfare and delineate the warfighter's highest priority operational capability requirements.

The Army Modernization Plan states the Army's funded plans for force development and modernization and clearly articulates goals for specific modernization efforts through its mission area modernization annexes. The Army Modernization Plan promotes better communication between the Army and industry and allows for the early identification of programs that are not feasible, given existing and planned funding. The Army Modernization Plan is a key factor in ensuring that the science and technology program is fully responsive to the needs of the user, i.e., the warfighter.

Force modernization is hindered, however, by the rising cost and long lead time of the acquisition process. The challenge is to continue to maintain our fielded technological edge while budgets are being rapidly reduced. We must transition to more efficient operation by widespread adoption of continuous modernization and integrated product and process development. The science and technology program must be closely linked to Army force modernization, focusing on upgrades and advanced systems and concepts that meet Army needs and delivering timely and affordable technologies that support those advanced systems and concepts.

ARMY SCIENCE AND TECHNOLOGY STRATEGY

To ensure that the Army science and technology program is consistent with national security, defense and U.S. Army requirements, the Science and Technology Master Plan (ASTMP) is prepared annually. This strategic plan for the science and technology program is based on the Army leadership's vision of the future Army, as constrained by realistic funding limits. It serves as "top down" guidance from the Headquarters, Department of the Army, to all Army science and technology organizations, and it provides a vital link between Defense S&T Strategy and the Army major commands, major subordinate commands, and laboratories. We are vigorously supporting the following five S&T management principles articulated in the Defense S&T Strategy:

1. Transition technology to address warfighting needs;
2. Reduce cost;
3. Strengthen the commercial-military industrial base;
4. Promote basic research; and
5. Assure quality.

The Army science and technology vision is to:

- Provide affordable and timely technology, training, and support that meets the warfighters' needs to enable swift, decisive, low-casualty victories across the spectrum of conflict by coalition forces, anywhere.
- Develop and maintain a world-class network of government and private S&T capabilities for shortened acquisition cycles that is responsive to rapid changes in policy and to advances in technology, and produce affordable technology and weapon systems.
- Foster an S&T system employing the best practices from any source to ensure continuous quality improvements, mutual trust, reduced cost, and managed risk.

The Army Science and Technology Agenda to support this vision is:

- Conduct "world-class" research and pursue technologies relevant to the Army, aided by peer review and Cooperative R&D Agreements with industry and academia.
- Comply with Defense and Army S&T vision and strategy, guided by a funding-constrained Army Science and Technology Master Plan.

- Strengthen the requirements process through intensive linkage with TRADOC Battle Labs and Advanced Concepts Technology II (ACT II), aided by advanced distribution simulation and advanced technology demonstrations.
- Improve efficiency by stabilizing S&T priorities and funding.
- Improve program execution and oversight.
- Attract, develop, and retain quality scientists and engineers.
- Downsize the S&T infrastructure while improving focus, productivity, and quality.

RESOURCING THE STRATEGY

The Army strives to maintain stable funding for the Army's 6.1 and 6.2 programs, consistent with the long-term nature of basic and applied research. Because we must protect readiness and the quality of life of today's force, however, the fiscal year 1996 budget request is 5.5 percent lower (8.5 percent lower considering inflation) than the fiscal year 1995 request and 25.9 percent lower (28.9 percent lower considering inflation) than the fiscal year 1995 appropriation. This comparison is normalized for the congressionally directed transfer of Chemical Biological Defense to the Office of the Secretary of Defense (OSD). Stable, focused S&T funding is important to avoid mortgaging our future. Today's modernization investment decisions will determine the legacy we leave future commanders and will determine the readiness of Force XXI to deal with agrarian, industrial, and/or information age enemies in the future.

In the basic research category (6.1), the Army maintains a strong peer reviewed scientific base through which technological improvements to warfighting capability can be assessed and implemented. Peer reviewers include many of this Nation's leading scientists and engineers from the National Academy of Sciences, National Academy of Engineering, Institute of Medicine, and the Army Science Board. In addition to conducting in-house research, Army scientists monitor developments in academia and industry and evaluate the many proposals received for 6.1 funds.

The exploratory development category (6.2) represents a challenging management problem since individual research programs often support a number of identified needs. The Army addresses this challenge by linking individual research programs to the systems they support or make possible. We are also vigorously pursuing the following three high priority technologies cited in the Defense S&T Strategy: information S&T; modeling and simulation; and sensors.

The final S&T program funding category—the 6.3 portion of advanced development—provides the path for the rapid insertion of new technologies into Army systems, be they new systems or product improvements. In the 6.3 category, components are tested and experimental systems are demonstrated to prove the feasibility and military utility of the approach selected. It is the 6.3 program that funds our Advanced Technology Demonstrations and Advanced Concept Technology Demonstrations.

Advanced Technology Demonstrations (ATDs) are characterized by the following: large-scale both in resources and complexity; the operator/user involved from planning to final documentation; tested in a real and/or synthetic operational environment; finite schedule, typically 5 years or less; cost, schedule, and objective performance baselined in an ATD Plan approved by the Army's Deputy Assistant Secretary for Research and Technology; and must meet or exceed exit criteria agreed upon by the warfighter and ATD Manager at program inception before the technology in question will transition to development. Active participation by the user, as well as the developer, is required throughout the demonstration. At least one demonstration at a TRADOC Battle Lab and an advanced distributed simulation are required. This enables the user to develop more informed requirements and the materiel developer to reduce risk prior to the initiation of full scale system development. ATDs seek to demonstrate the potential for enhanced military operational capability and/or cost effectiveness. ATDs are developing and demonstrating critical technologies ranging from the 21st Century Land Warrior to integrated survivability for future rotorcraft and armored vehicles.

Advanced Concept Technology Demonstrations (ACTDs) are jointly planned by the warfighter and acquisition communities. ACTDs allow operational forces to experiment in the field and in simulation with new technology and concepts to determine potential improvements in doctrine, training, leadership, organizations, tactics and warfighting concepts. A Commander in Chief (CINC) sponsor is required. Following successful demonstration with the sponsor, the capability is rapidly prototyped and left for up to 2 years with the CINC, thus giving him an interim, stay-behind capability pending formal acquisition decision. The Army has three ACTDs:

1. The Joint Precision Strike Demonstration ACTD is developing and demonstrating a system-of-systems concept that integrates surveillance, target acquisition, command, control, communications, precision weapons delivery and combat assessment functions for rapid execution of strikes against high value, time-critical targets at extended ranges in minutes, not hours, day or night and even in bad weather, when aircraft are not often available. Last year at the Army Integration and Evaluation Center near Fort Belvoir, Virginia, we demonstrated to several members of the Roles and Mission Commission, Congressional Staff, Joint Staff and Office of the Secretary of Defense advanced target acquisition capabilities and automated deep operations coordination in conjunction with the employment of deep fire systems against high priority targets. The use of long-range, surface-to-surface improved Army Tactical Missile System (ATACMS) capable of destroying soft targets, under adverse weather conditions, in a precision strike scenario was demonstrated using a national network of live, virtual and constructive simulation and live firing of the ATACMS missile at White Sands Missile Range, New Mexico. The fiscal year 1996 budget request will fund the demonstration in Korea of a much improved counterfire capability against simulated enemy long range multiple rocket artillery operating from heavily fortified and protected positions in mountainous terrain. Emerging technologies will be integrated with advanced concepts and doctrine to ensure timely and responsive target acquisition and streamlined command and control to destroy enemy multiple rocket launchers swiftly to protect our troops in South Korea.

2. The Rapid Force Projection Initiative (RFPI) ACTD is demonstrating technologies, concepts, and tactics to permit our early entry forces to defeat heavier forces, yet with improved deployability of our light forces. RFPI employs a "Hunter/Stand-off Killer" approach which relies on forward deployed sensors connected to precision, indirect fire weapon systems to attack an enemy armored force beyond direct fire range. Several stand-off killers will be evaluated, including a guided MLRS, guided mortar rounds, smart mines and the Enhanced Fiber-Optic Missile. Simulations by TRADOC and government contractors have shown high potential for the RFPI approach to improving the survivability, lethality and deployability of our 'first to fight' forces.

3. The Mine/Countermine ACTD is a joint effort by the Army, Marine Corps and Navy to demonstrate improved technology, concepts, doctrine, tactics and organizations to counter the mine threat from the sea, across the beach and inland. The Army has the lead for the detection and neutralization of the landmine threat. The emphasis is on remote detection and neutralization, both by vehicle mounted and dismounted approaches.

SCIENCE AND TECHNOLOGY OBJECTIVES

To better focus our scarce S&T resources on the customer's highest priority needs, the Army has established a set of 200 Science and Technology Objectives (STOs). A Science and Technology Objective states a specific, measurable, major technology advancement to be achieved by a specific fiscal year. It must be consistent with the funding available in the current year budget and the Program Objectives Memorandum (POM) for the Future Years Defense Program (FYDP) years. Only major, measurable, and foreseeable objectives are designated as STOs. Not every worthwhile, funded technology program is cited as a STO, because the Army must reserve some program flexibility for the laboratory or research, development and engineering center director to seize opportunities within his or her organization, based upon the organization's local talents and resources.

As is the case with ACTDs and ATDs, the Army science and technology community uses the STOs to focus the program, practice management by objectives, and provide feedback to our scientists and engineers regarding their productivity and customer satisfaction. STOs are reviewed and approved annually.

TECHNOLOGY TRANSFER

The Army continuously monitors new developments in the commercial sector looking for military applications. This "spin-on" of technology is of growing importance to the Army S&T program—not only from the domestic R&D programs but also from development overseas.

Conversely, where military R&D is in the lead (e.g., rotorcraft, night vision, infrared sensors) technology transfer to commercial uses is actively pursued. This "spin-off" of technology is important to our economic security. Some of the Army initiatives strengthening domestic technology transfer include:

- **Cooperative R&D:** It is Army policy to actively market technology that can benefit the public and private sectors, and to respond quickly to requests for technical assistance. The mechanisms for accomplishing this are Cooperative R&D

Agreements (CRDAs), the Construction Productivity Advanced Research (CPAR) program, Patent Licensing Agreements (PLAs), and technical outreach programs. The cumulative Army totals from 1989 to 1995 are 431 CRDAs, 59 CPAR agreements, and 42 PLAs. Of these 490 agreements, 289 were still active in fiscal year 1994.

- **SBIR Programs:** The Small Business Innovation Research (SBIR) Program was begun in 1982 by act of Congress. The Army is a key participant in this DOD-wide program to stimulate technology innovation in small businesses to meet Federal R&D needs. The fiscal year 1995 Army funding for this program, which has had some remarkable successes, was $95.9 million, which includes $4.5 million for the Small Business Technology Transfer (STTR) program.
- **University Research Centers:** The policy is to further Army basic research objectives by leveraging research programs in our world class academic institutions. To accomplish this, the Army Research Office, Research Triangle Park, North Carolina, sponsors research through the Army Center of Excellence Program and through the Defense University Research Initiative. Through these programs the Army focuses active research participation with more than 20 American universities.

PROJECT RELIANCE

In November 1991, all three Service Acquisition Executives directed full implementation of Project Reliance in their respective services. Implementation of Tri-Service S&T Reliance also responds to (and provides inputs for) a number of important management functions and planning processes including the budget planning process, development of technology investment plans, and updates of the Defense Science and Technology strategy.

The goals of the DOD S&T Reliance are to:

- Enhance science and technology;
- Ensure critical mass of resources to develop "world-class" products;
- Reduce redundant capabilities and eliminate unwarranted duplication;
- Gain efficiency through collocation and consolidation of in-house work where appropriate; and
- Preserve the Services' mission-essential capabilities. The Study Phase of Reliance resulted in formal service agreements for joint planning, collocated research, or consolidation under a lead service for each of the technologies that were not service-unique.

Managing technology development is a dynamic process, and the S&T activities of the three services are not islands unto themselves. The notion of "leveraging" is based on a simple fact: The services' individual S&T accounts cannot fund all the R&D activities that any one service needs.

INFRASTRUCTURE

Laboratories and research, development and engineering centers are the key organizations responsible for technical leadership, scientific advancement, and support for the acquisition process. Working at a diversified set of physical resources, ranging from solid-state physics laboratories to outdoor experimental ranges, these personnel conduct research, technology development, "smart buyer," and fielded systems engineering support activities for the total Army.

The Army is consolidating laboratory and R&D center facilities, eliminating aging and technologically obsolete facilities, and leveraging relevant facilities of contractors and the other military services. Our in-house facility investments are focusing on those unique capabilities that truly must be owned by the Army itself.

Converting the Army Research Laboratory to an open, federated laboratory system is a major initiative that has caught the imagination and strong support of government, industry, and university researchers and leaders. A Broad Agency Announcement was released in December 1994 soliciting to competitively enter into 5 year cooperative agreements with consortia for cooperative research in five areas critical to achieving Force XXI: telecommunications and information distribution; advanced sensors; advanced distributed simulation; software and intelligent systems; and advanced/interactive displays. Consortia must include a leading industry laboratory, historically black college/university or minority institution (HBCU/MI), and non-HBCU/MI university partners. There will be a mutual exchange of technical staffs between the government and consortia. One consortia will be selected for each of the five areas this year. The Army appreciates the Senate Armed Services Committee's strong endorsement in congressional language last year for this important initiative.

Highly motivated, competent, well-trained people are essential to the success of the Army science and technology strategy. Keeping the in-house work force technically competent in a rapidly changing environment is a high priority objective for the future. The Reinvention Laboratory initiative allows revised procurement rules and personnel initiatives which will assist in meeting the challenge. Allowing Army scientists and engineers to perform more research at the bench has long been recognized as the number one recruitment and retention factor. Letting them share that bench with the best in class from industry and academia via the open, federated laboratory initiative will clearly strengthen the smaller Army laboratory system of the future.

CONCLUSION

The Defense Science and Technology Strategy, Technology Area Plan, and Army Science and Technology Master Plan contain the vision, strategy, plan, and funded program to provide the technological capability for swift, decisive, low, casualty victory on the battlefields of tomorrow and successful operations short of war. The Army Science and Technology Master Plan projects the development and maturation of technologies for the Army's future systems and system upgrades. Indeed, it is this transition of technology into affordable hardware which makes the science and technology program a sound investment of taxpayer resources.

The Army must be trained and ready when the Nation calls. A smaller Army must be more modern, versatile, agile, and deployable to defeat larger forces. The Army is counting on our laboratories, research and development centers, academia, and industry. We must perform world class research that is most relevant to the Army of tomorrow. The highest priority technologies must be identified, developed, and transitioned to the land warrior swiftly. General Sullivan's Force XXI initiative supported by the Battle Laboratories, Advanced Concept Technology Demonstrations, and Army Advanced Technology Demonstrations are shaping the 21st century Army.

Although we must protect today's readiness and the quality of life for our soldiers and their families, today's investment decisions will become tomorrow's readiness in the not too distant future. We cannot continue to defer the modernization of our Army if we are to have a ready future force. As Secretary of Defense Perry stated on November 18, 1993:

> In 1945, with the end of the Second World War, America began a major drawdown of its military forces. Five years later we were almost pushed off the Korean peninsula by a third-rate regional power. After Vietnam we had another big drawdown, and five years later the Chief of Staff of the Army proclaimed that we had a "hollow Army." Today, after the Cold War, we're beginning a third major drawdown. This time we've got to get it right.

Thank you.

Senator SMITH. Secretary Slatkin, let me just say before you start that my daughter goes to arch rival Lafayette, and one of her friends brought her a T-shirt the other day from Lehigh saying, "Friends don't let friends go to Lafayette." [Laughter.]

I promise, because I am a Navy man, I am not going to hold that against you. Go ahead.

STATEMENT OF HON. NORA SLATKIN, ASSISTANT SECRETARY OF THE NAVY FOR RESEARCH, DEVELOPMENT AND ACQUISITION

Ms. SLATKIN. Thank you, Mr. Chairman.

Mr. Chairman, Senator Bingaman, thank you very much for the opportunity to present the Department of the Navy's Science and Technology Program and our fiscal year 1996 budget request. I am accompanied today by Admiral Marc Pelaez, our Chief of Naval Research.

And as you proposed, with your permission, I would like to submerge—submit my prepared statement for the record and make a few brief remarks——

Senator SMITH. "Submerge" may have been right for the Navy. [Laughter.]

Ms. SLATKIN. And also show you one or two examples, if I may.

First, let me report to you from my vantage point, the Department of the Navy—and it is not just the U.S. Navy, but it is also the U.S. Marine Corps—our recapitalization plan is on track.

Frankly, we must stay the course. That means reducing our force structure and right sizing our infrastructure. We are committed to that, because that is the only way we will be able to free up resources to continue to modernize our equipment well into the future.

Indeed, science and technology is a key piece of our recapitalization plan. It requires that we continue our investment in our seed corn, as Dr. Kaminski notes, because it is the foundation of our future modernization program.

I believe you will see that our fiscal year 1996 budget request reflects this priority that not only Secretary Dalton and I share, but also the CNO and the Commandant share as well, in putting our program together.

Furthermore, you will see, as you look at the Department of the Navy's program, even though our overall investment resources have declined, we have attempted to protect the science and technology account, our seed corn.

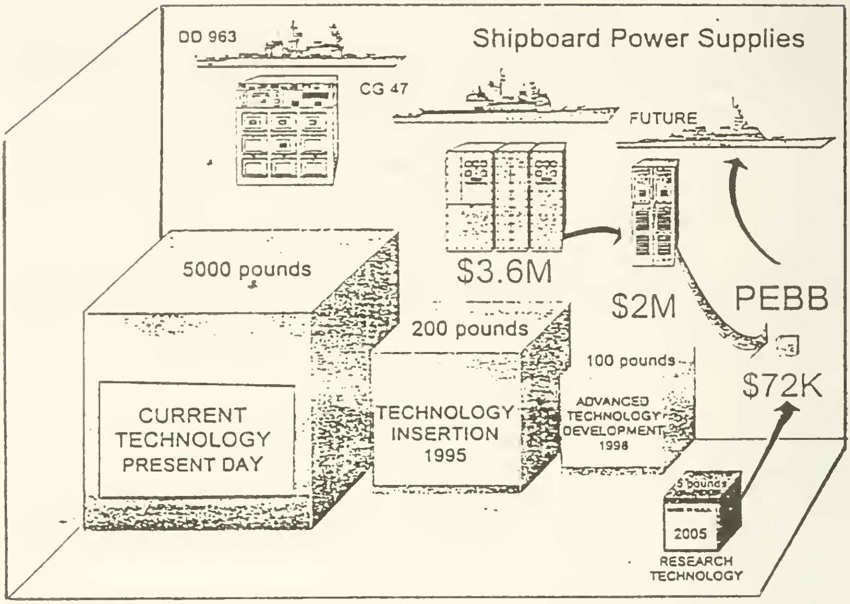
I would like to address two issues with you today. First, what does science and technology do for us—why do we need it? And second, how do we transition technology to the warfighter?

We believe we need science and technology at every step in the acquisition process. Indeed, as others have said today, science and technology does two fundamental things for us.

First, it allows us to support our warfighters by giving us the ability to insert appropriate advanced technologies into our systems. And second, it enables us to make our systems more affordable, not only in the initial investment but, in the cost of ownership as well.

I would like to use a few examples to illustrate this point.

Power Electronic Building Blocks



For our ships and submarines today, we are still using a circuit breaker that was originally designed by Admiral Rickover 40 years ago.

Here is a pictorial of one on a surface ship. While the design has served us exceedingly well over the years, it is heavy, it is large, and it is not nearly as capable as this little device. This device is called a Power Electronic Building Block.

I wonder if you would take it forward to Senator Smith.

It is basically a solid state device for power distribution and power control. This is in concept demonstration, but it promises tremendous savings, as you can see from the chart, in terms of weight and size, with increased capabilities.

Twenty-four of these PEBBs, Power Electronic Building Blocks, would replace, on our ships today, circuit breakers that are the size of two large filing cabinets and weigh over a ton—24 PEBBs would replace over a ton.

Now, that is dramatic savings in terms of designs for all of our ships, whether they are submerged or on the surface. You see three orders of magnitude improvement in terms of weight.

This is how the science and technology that we are doing in our 6.1 and 6.2 areas apply to our ability to build systems well into the future.

Likewise, the component that you see in front of Clark Fiester is an aircraft radar receiver. It uses a power supply just as large.

With Microwave Monolithic Integrated Circuits, or MMIC for short, we are now able to replace two of the large components that you see here with this one item of MMIC equipment.

MMIC

Microwave Monolithic Integrated Circuit

	OLD	NEW
Weight:	32 pounds	18 ounces
Power Usage:	250 watts	14 watts
Cost:	$240,000 (actual)	$11,000 (estimated)

Performance (Radar Range the Same)

That is a dramatic difference, as you can see from this chart. The MMIC provides the same radar performance. You can also see additional dramatic differences, not only in weight and power usage, but also in cost.

The two pieces of equipment are what we are using today on our EA6–B electronic warfare aircraft. The MMIC will provide improvement in terms of packaging and capability and will really yield us advancement, not only in terms of our cost of procurement, but in terms of our cost of ownership.

So as you can see there is great advantage in terms of what we are doing in the science and technology base for our forces well into the future.

Indeed, as Dr. Kaminski said, our advances in electronics packaging, because of what we are doing in MMIC, allows us to put three functions into one circuit that you see here today. This is something that we have never been able to do before.

The MMIC has numerous implications, as you can well imagine for all of our systems. And, it demonstrates the real benefit to the warfighter.

While all of this seems obvious, it is not always the case to make similar statements about our basic research effort.

As you know, basic research often takes 15 to 20 years of investment—some of it high risk—across a broad spectrum of fundamental knowledge to yield the components of a modern weapon system. We must invest across this broad spectrum, because we cannot accurately predict where the research breakthroughs will be.

Perhaps only 10 percent of these investments will yield us major advancements. But, when they do occur, as the examples I have shown you, you can see the real breakthrough in terms of the warfighter.

In supporting the warfighter, as I said, we are also interested in reducing the cost of ownership. We have a science and technology program that we are doing this with in terms of helicopter maintenance. This effort is called the Air Vehicle Diagnostic System.

Current helicopter maintenance procedures call for us to periodically remove and inspect all components based on flight hours or the calendar. Clearly, that is not an efficient way to reduce cost of ownership.

What we have underway is a major change to the way we will do maintenance. It is a computer-based system for our helicopters that will indicate the health of the components on a real-time base, so we are able to repair or replace only those parts that we need to change.

We do it only when it is necessary, so we are saving real money in terms of reduced cost of ownership. Again, advanced technology reduces costs.

Finally, I want to spend a minute, as Gil Decker and Dr. Kaminski did, on how we transition these advances to the warfighter.

I said earlier our process includes deliberation, roundtables with the CNO and the Commandant and all of the operational users. We have, in each of the military departments, Advanced Concept Technology Demonstrations, ACTDs. The ACTD is really the way we transition technology to the warfighter.

It is also a way to give the warfighter a chance to work on tactics with new technology. These efforts not only guide our investments, but they give the CINCs a real opportunity to feed into our system and give us useful feedback on technology that they are interested in and things that will make a major change in war fighting capability.

There are three demonstrations that the Navy is actively involved in, and I would like to take a minute to describe them.

First, you all know that countering mines is a major problem for us, especially in the littorals. So we have an ACTD dealing with joint counter-mine demonstration with the Army, because they also have a counter-mine problem. We have this ACTD that will demonstrate the capabilities needed for mine countermeasures for operations from the sea all the way inland.

Just as important, with the ACTD we will leave a substantial capability in place after this demonstration. General Jack Sheehan, the Commander in Chief, U.S. Atlantic Command, is the sponsor for the ACTD. So, we will learn a great deal.

Second, we have an ACTD that is built for cruise missile defense. And, as Dr. Kaminski said, this is an urgent threat to our forces. The Navy is participating with Army and ARPA in what we call the Mountain Top ACTD to look at detection, tracking and shooting down cruise missiles.

The third ACTD that I want to point out in the Department of the Navy is a Precision Spaceborne Targeting System. This is a concept to provide information from the sensor to the shooter.

Our focus on affordability just does not end with technology development. We are also managing our acquisition infrastructure more efficiently. This is an issue that both of you raised with the previous panel.

First, we are trying to be more efficient in two ways. Our recent BRAC list shows 19 technology centers and warfare centers that we are recommending for closure or consolidation, yielding significant savings in the future.

Second, we industrially fund our infrastructure. So program managers in our warfare centers use our infrastructure on a pay-as-you-go basis. They only pay for what they use.

We are only keeping an infrastructure around that is being used and being paid for by the warfighter and the program manager.

Mr. Chairman, Senator Bingaman, your support is critical to the success of the Naval forces in the future. Thank you very much for giving me the opportunity to appear here.

Senator SMITH. Thank you.

[The prepared statement of Ms. Slatkin follows:]

PREPARED STATEMENT BY HON. NORA SLATKIN, ASSISTANT SECRETARY OF THE NAVY (RESEARCH, DEVELOPMENT AND ACQUISITION)

Mr. Chairman, distinguished members of the subcommittee, thank you for this opportunity to appear before you to discuss the Department of the Navy's Science and Technology Program and fiscal year 1996 budget requests.

First, let me report to you that from my vantage point, the Department of the Navy's recapitalization plan is on track. We must see that it stays on track, by supporting long term weapon item modernization programs. These modernization programs support an enduring goal—providing our rightsized force with a technological advantage over potential adversaries. In fact, with a smaller force, this technological advantage becomes mandatory. Coupled with the kinds of new missions and threats encountered in the post-Cold War world, we anticipate continued demand for advanced technology solutions.

There are several dominant trends that have emerged since the end of the Cold War. First, the overarching need is for affordability. Every dollar must count, from basic research through delivery of weapon systems to the fleet. Second, in several areas, technological breakthroughs in the commercial sector are outpacing the defense establishment. This is particularly true with computers, communications, and advanced materials. And third, the longer service life of our platforms means that we must find ways to modernize by inserting advanced technologies and reducing life cycle costs.

Through a process of continuous evaluation, we have adjusted our Science and Technology programs to successfully meet the challenges posed by these emerging trends. Our programs are designed to support the warfighter while optimizing return on our investments. This philosophy is reflected in the Department's 1996 budget request.

FISCAL YEAR 1996 BUDGET REQUEST

The Department's science and technology program is comprised of three components:

[Dollars in millions]

	Fiscal year 1996 request
Basic Research	$402
Exploratory Development	479
Advanced Technology Development	500
Total	$1,381

We have made the difficult choices to preserve a robust science and technology base as part of our overall budget. We continue to maintain a strong basic research program. We devote one third of our basic research program on Navy-unique ocean sciences research. The overall basic research effort provides the understanding of fundamental processes and a cadre of experts that enable us to think beyond incremental development of existing systems and create revolutionary changes in capabilities. As the first element in the acquisition process, it closely supports our development and demonstration programs.

Our science and technology program is highly leveraged through coordinating our investments with the other services, the Department of Defense, other government agencies, universities and industry. Our objective is to avoid investment duplication and to focus investments on Navy relevant issues. While our science and technology program request is small in proportion to the Department's entire budget request, leveraging gives it greater impact and is a vital component of our investment strategy.

RETURN ON INVESTMENT

Often it takes 15 to 20 years of science and technology investment to transition fundamental knowledge gained from basic research into a component of a modern weapon system. The value of investments in science and technology is obscured by the difficulty in tracing the linkage from basic research to the end product.

Past science and technology programs starting with basic research are the major source of our technological superiority today. For example, work in composites and advanced materials have enabled us to build aircraft that are lighter weight and have the strength and durability necessary for aircraft carrier operations; work in hydrodynamics and propeller quieting have led to improved seakeeping and silencing capabilities for DDG–51 class ships; and the towed array sonar on our submarines has resulted from work initially completed in the naval science and technology program during the 1960s and 1970s.

Another example, microelectronic circuits using high performance semi-conductor material were developed through a Navy grant by Dr. Carver Meade at CALTECH. His work in the 1970s and 1980s has made possible a wide range of microwave electronic devices, communication systems, and radars now used extensively in the fleet.

The Global Positioning System is a more recent example. This technology allows our forces to use precision guided munitions to strike with surgical accuracy. The technological capability successfully transitioned from Navy Science and Technology proof of concept to the Global Positioning System used today by both the military and commercial sectors. Our entire Nation has benefited immensely from such achievements.

We also have a formalized program for risk reduction demonstrations as part of our Exploratory and Advanced Technology Development efforts. The flexibility to transition technologies directly to the fleet from our science and technology programs allows us to maximize return on investment while reducing cycle times and costs.

For example, we recently completed an Advanced Technology Demonstration of a Quiet Surface Ship Propeller which demonstrated a significant reduction in high speed cavitation, which means less noise and fuel consumption. This work is now transitioning directly to guided missile destroyer and aircraft carrier acquisition and product improvement programs. Overall development costs and high technological risks were significantly reduced by this demonstration.

In another example, we validated that a five-line towed acoustic array could be successfully deployed at sea from a surface ship. This array has the potential for significantly improving performance over existing single line systems to detect quiet enemy submarines. It would not have been possible to take the risk of placing systems of this nature aboard our surface ships and submarines if their feasibility in a real-world environment had not been previously demonstrated.

Finally, we have recently completed a successful demonstration that placed an existing U.S. Army ballistic missile and launcher (Army TACMS) on a Navy ship and demonstrated the firing accuracy of the missile while the ship was moving. We are currently evaluating its effectiveness and utility as an option for future naval surface fire support.

AFFORDABILITY

Today, developments must not only offer technological improvement, they must also be affordable in the context of acquisition and life cycle costs. Considerations for affordability are borne by all science and technology projects from the earliest possible opportunity. Our science and technology programs are making significant reductions in life cycle costs and making technological improvements and upgrades to existing systems possible.

For example, Submarine Safety (SUBSAFE) Level-1 fasteners are a critical component of submarine construction and repair. A few years ago, the Portsmouth Naval Shipyard required 13 steps on eight different work stations to manufacture, inspect, and certify critical fasteners. Through one of our Naval science and technology programs, a single computerized work station was devised which saved time and significantly reduced the rejection rate. This technology is available to the entire nuclear component industry.

Other examples of science and technology supporting affordability include:

Low Alloy Hull Materials. Experiments with less expensive low-alloy steels have suggested ways of improving the strength-to-weight characteristics of less-expensive steels and making them attractive for shipbuilding.

Condition-based Maintenance. The Air Vehicle Diagnostic System, is a condition-based maintenance enabling technology for on-board, computer based, mechanical diagnostic systems for helicopters. Potential impact on life cycle cost includes: lowered depot maintenance costs by reducing or eliminating the current false removal and repair rate; reduced routine maintenance and decrease in fuel consumption by reducing calibration and check flight operations. We are looking to this approach across the full range of Naval systems in order to reduce the costs of ownership.

Embedded Training. The computerized nature of modern naval systems enables us to embed system-based intelligent training technologies into operational systems. These training systems will significantly reduce direct training costs. Additional savings will be realized through reduced travel costs, reduced need for classrooms and associated logistics. By utilizing built-in training modes, we gain greater training effectiveness and the flexibility inherent in on-demand training capability available anywhere at any time.

SUPPORT TO THE WARFIGHTER

Near-Term Support

We are supporting the fleet through near-term efforts such as providing scientific advisory services, identification of future joint operational requirements and technology opportunities, and setting priorities for science and technology. Our in-house cadre of science and technology experts allows us to identify, transition or apply emerging science and technologies that focus on fleet warfighting needs. These in-house experts help the Department guard against technological surprise, while at the same time, they exploit scientific discoveries to the benefit of the warfighters.

Most importantly, this capability allows us to leverage our resources by minimizing risk before we commit to develop and acquire new systems. This supports acquisition and the warfighter by providing leading edge technological options that are affordable.

Support to the warfighter is also provided by Navy science and technology advisory staff attached to fleet and theater commanders. These personnel are on site to identify fleet problems, needs and requirements and communicate them to technologists at our warfare centers, laboratories, and universities. This "real-time" interaction provides rapid response to their problems.

Fleet requirements constantly change to respond to new threats and missions. Therefore, we have initiated a program to provide fleet commanders with options for advanced technology insertion. Known as "Technologies for Rapid Response", this compilation of capabilities includes rapid fleet introduction of prototypes to meet changing requirements.

Advanced Concept Technology Demonstrations

Our science and Technology programs support our acquisition programs not only with new breakthrough technologies, but also guide acquisition investment in support of the warfighter by providing an opportunity to understand the capabilities in the field.

We strongly support the Advanced Concept Technology Demonstrations because they provide a direct link to the warfighter. These efforts are closely coordinated with the Joint Requirements Oversight Council and the particular Unified Commander in Chief involved. Our Advanced Concept Technology Demonstrations provide our operational commanders with technological solutions to critical problems by focusing on specific validated requirements. They are excellent examples of the direct link between science and technology and our Sailors and Marines.

These demonstrations are designed to develop and exploit detailed doctrine and tactics as well as demonstrate hardware. When the demonstrations are completed, the warfighters are left an advanced capability for continued use, evaluation and tactical development. The three Navy demonstrations include:

Joint Countermine Demonstration: Countering mines is a critical problem for the Department to solve. Mines allow the enemy to neutralize our forces and hold us at risk at a minimum cost and risk to his own assets. To meet this threat, we have instituted a joint Advanced Concept Technology Demonstration with the Army that utilizes the relatively mature technologies emerging from a number of ongoing programs to demonstrate the capability to conduct amphibious mine countermeasures operations from the deep ocean forward into littoral regions inland. Major emphasis is placed on resolution of deficiencies in clandestine surveillance, reconnaissance, command, control, communications and intelligence. It will explore both sea and land countermine doctrine and tactics as well as leave a substantial countermine capability in place following the demonstration. General John Sheehan, the Commander in Chief of U.S. Atlantic Command is the sponsor for this effort.

Cruise Missile Defense (Mountain Top) Demonstration: The latest generation of stealthy cruise missiles pose a particular threat to our surface fleet and on shore forces. Because of their speed and stealth, we must be able to engage cruise missiles at greater distances from our forces. Our effort focuses on over-the-horizon detection, tracking and engagement beyond the horizon from an elevated sensor suite by sea and land air defense systems. The Army, Air Force, and ARPA are participating in this effort that will be conducted in the Pacific. This demonstration effort will be useful as part of our Cooperative Engagement Capability.

Precision Spaceborne Targeting System: Theater commanders need real-time highly accurate targeting information. This classified program demonstrates high precision targeting in near real-time using existing national and tactical assets. The concept provides targeting information directly from the sensor to shooter and has already demonstrated in two live-fire exercises a capability far beyond what had previously been available to the warfighter.

SUMMARY

This is a time of great change and challenge for the Department of the Navy and our Nation. We need your support to maintain our critically important technological advantage. We firmly believe that our science and technology programs and the fiscal year 1996 budget request reflects the right choices and supports a rightsized Navy-Marine Corps team equipped with the technologically superior weapons, systems, and platforms that will give them the winning edge.

Senator SMITH. Secretary Fiester.

STATEMENT OF HON. CLARK FIESTER, ASSISTANT SECRETARY OF THE AIR FORCE FOR ACQUISITION

Mr. FIESTER. Well, I welcome the opportunity to discuss the Air Force S&T program with you here today. There are just a couple of points I would like to make about the Air Force S&T program.

First, in formulating and evaluating our S&T program, we do put extreme emphasis on warfighter relevance. We bring together senior officers from all of the major commands, Air Combat Command, Air Mobility Command, Space Command, PACAF and USAFE, bring senior officers together to go through the program as it is being formulated and then, at various times throughout the year, to rate the programs as far as military relevance is concerned on a scale of 1 to 10.

In addition, then, we have the Air Force Scientific Advisory Board review, on an annual basis, the program from the standpoint of technical quality and again rate the programs on a scale of 1 to 10, so that we then have the tools available to us to look at those programs that are not on both scales up very high in the rating, and then take a hard look at those programs and examine whether those programs should be replaced with other efforts or be modified or changed in some way to drive them up higher on the scale of ratings.

The other point I would like to make about the Air Force program is, under downsize of conditions, there is, I think, a continued pressure to move more work back in house in the government.

I know the last few years I was in industry, I saw this across many of our customers, both in DOD, as well as in the intelligence agencies. And we have taken a very hard line on that within the Air Force.

We are—our policy is that no more than 20 percent of the work will be done within the Air Force, and 80 percent will be contracted out.

We believe some level of in-house effort is needed to make us smart buyers and to have technically qualified people that we can call upon for various assignments.

But we really strongly believe that the money is best spent by the defense industry. And it is the best way to achieve the transfer of the technology into the hands of the defense industry. So we are planning to maintain a firm position on that 80/20 ratio.

I guess the other observations, in the few months I have been in this job, is that by far the biggest problem I am facing is affordability of our systems. The Air Force has developed some really outstanding systems over the past number of years.

The issue I am faced with is: Can we afford to buy enough of these systems to properly modernize the Air Force, to fully modernize the Air Force?

And the two approaches we are addressing here, one, as Gil Decker mentioned and Nora, acquisition reform. And I can assure you that the three of us are working very hard at that. And I think we are starting to now see some really concrete results of very substantial savings through the acquisition streamlining that we have been undertaking.

The second approach then is to look at how we can utilize technology to achieve affordability, and we are working on a number of initiatives there under the S&T program.

One of the key efforts is what we call the lean aircraft initiative, which is being headed up by MIT based on the success they had in achieving more affordable and much higher quality cost in the U.S. automobile industry.

We are looking at the approaches they took there in affordable manufacturing and how we can apply those to the defense aircraft industry.

Also, we are looking at bringing the issue of how do we produce this system on a much more affordable basis much earlier into our whole acquisition process.

A good example of that was—I was down at Marietta, GA, a couple weeks ago for the critical design review on the F–22.

At the same time that we completed the critical design review, we were able to hold a production readiness review, that we had done enough advance work on how we were going to be able to—what processes we were going to put in place, what tooling we needed to produce the F–22 on an affordable and efficient basis, that we could actually have the production readiness review at the time we completed the critical design review.

So these are the areas that we are starting to look at, in addition to ensuring that we have technology that provides the Air Force with the leading edge. We are also looking at the whole issue of affordability and how we can utilize our S&T program to achieve more affordable, more producible, higher quality systems.

Thank you very much.

Senator SMITH. Thank you very much, Secretary Fiester.

[The prepared statement of Mr. Fiester follows:]

PREPARED STATEMENT BY HON. CLARK G. FIESTER, ASSISTANT SECRETARY OF THE AIR FORCE FOR ACQUISITION

AIR FORCE SCIENCE AND TECHNOLOGY

GENERAL INTRODUCTION

Mr. Chairman, Members of the Subcommittee and staff, the Air Force welcomes the opportunity to discuss our Science and Technology (S&T) Program. The Air Force agrees with Dr. Kaminski that our Science and Technology programs are the foundation of our future military capabilities. By focusing on its S&T program, the Air Force can produce technologically superior weapon systems for the warfighter within current fiscal constraints. Under this effort, the Air Force will develop technologies which enhance military capability while maintaining the economic security of the United States.

ROLE OF AIR FORCE LABORATORIES

The goal of the Air Force S&T Program is to provide the technical foundation of the National Global Reach—Global Power objectives by providing the competitive advantage and maximum warfighting potential of advanced technology. Superior technology gives us the edge against any potential enemy and reduces the risk to our own forces. In addition, we must strive to make future weapon systems more affordable and to leverage commercial technology advances for military needs wherever possible.

As most of you know, the S&T program is comprised of three components: basic research, exploratory development, and advanced development. Under the basic research, we develop our knowledge and understanding of relevant scientific principles such as physics, chemistry, mathematics and electronics. This work is primarily accomplished at universities and our service laboratories. The principal output is the development of broad, generic technology options. The exploratory development program focuses these options on developing and maturing emerging technologies directed toward military applications. It provides proof of concept evaluations and feasibility demonstrations structured around laboratory analyses, experiments, and models. The advanced development program matches these promising technologies to user requirements by further evaluation of their military utility. It demonstrates technologies and design concepts with sufficient promise for eventual transition into production. Some of the more matured technologies proceed to Advanced Concept Technology Demonstration (ACTDs) which are closely tied to the user and provide a rapid means of technology transfer. Other technologies may require further risk reduction before proceeding to a Demonstration Validation program.

The majority (>80 percent) of the S&T budget is contracted out, while the remainder (<20 percent) is used to support the laboratory in-house research programs which allows the Air Force to retain the ability to be a "smart" buyer of technology and maximize the taxpayers return on investment. Our in-house and contracted research programs are highly synergistic and appropriately balanced to serve our mutual objectives for high quality technology development and demonstrations that are militarily relevant. The Air Force is proud of its record in research, development, demonstration, and transition of new technologies into fielded system upgrades and new system developments. During the conflict in the Persian Gulf, our A–10s, F–15Es, F–16s, and KC–10s all exhibited mission capability rates of 95 percent or more.

Investment in S&T has been good for America. We are able to explore the widest range of options, cull the non-players and select the pearls for further development. For example, the laboratories played an integral role in the development of stealth technology for the F–117 which was so effective in the Persian Gulf war. They developed the "fly-by-wire" technology which has replaced mechanical controls with high quality, reliable digital systems—on both military and commercial aircraft.

While we are fundamentally dedicated to developing military technologies, we also feel responsible to facilitate technology availability to enhance the economic vitality of the Nation. Successfully transferring technology requires sound, two-way communication between the laboratory and the private sector to determine what is available and what is needed. We have found the best way to bridge this cultural gap is to use credible technology intermediaries. This is done through our Offices of Research and Technology Applications (ORTAs) that were established at selected locations within the Air Force Material Command Centers and the laboratories. The ORTAs interact through a series of national, State, and regional/local networks to provide the private sector access to technology information developed or supported by the Air Force for our military requirements. The following are some examples of successful technology transitions. The commercial turbine engine industry has significantly profited from the core engine demonstrations on the Integrated High Performance Turbine Engine Technology program. In addition, we successfully developed low cost transmit/receive modules for the F-22 active array radar which has been commercialized and used in school buses where it proved itself by preventing a collision of a bus with a small child.

QUALITY AND RELEVANCE

To ensure the technical quality and military relevance of our S&T Program, we utilize the Air Force's S&T Master Planning Process to provide us with technical evaluation criteria and metrics, plus a strong direct interaction with the operational users. This planning process involves the Air Force's product, test, and logistics centers and the operational commands to match technology opportunities and operational needs. The foundation of the Air Force planning process is the relevant guidance provided in the national security objectives, Joint Staff Guidance, the DDR&E S&T Programming Guidance, and guidance from the Air Force Acquisition Executive. The quality of the technology program is ensured by peer review and involvement of the Air Force Scientific Advisory Board and other S&T peer review groups, such as the Defense Science Board and independent review groups.

AFFORDABILITY

The Air Force's long established focus on technologies which enhance performance, reliability, maintainability, sustainability, and now increasingly on affordability, includes finding ways to reduce manufacturing costs early in the technology development process. Through the Air Force Manufacturing Technology (ManTech) Program, advanced manufacturing and production methods are integrated into the product technology development process at the earliest stages. The ManTech program is predominately contracted to industry which ensures the transition of new manufacturing technology into both military and commercial applications to provide affordable process technology coupled to classical product technologies resulting in affordable defense systems acquisition. Another extremely important element in affordable weapon systems is the development and demonstration of software technologies. We are in a rapidly changing information age and a key factor is reusable software that can be applied to multiple weapon systems.

DEFENSE S&T RELIANCE

We have made excellent progress in the Tri-Service S&T Reliance effort. Reliance is a set of formal agreements among and implemented by the military departments for joint planning, collocated in-house work, or lead service assignment. Joint planning performed under Reliance encompasses both in-house and related contract S&T work in the services and Defense agencies. We are working closely with the DDR&E to continuously refine the Defense S&T Reliance process. The Air Force is committed to making Defense S&T Reliance work. Along with our counterparts at other service and agency S&T activities, the Air Force is making a special effort to guarantee the Defense S&T Reliance process completes its evolution from joint execution planning and coordination to joint investment strategy formulation.

S&T INVESTMENT

The Air Force recognizes the importance of the Future Joint Warfighting capabilities identified by the Joint Staff as being a benchmark for technological superiority in joint operations.* Air Force S&T program will focus its technology development efforts on providing the five future capabilities that have been identified as critical for the future battlefield.

AIR FORCE S&T BUDGET

The Air Force is committed to maintaining a robust S&T Program, but we also recognize that sustaining S&T funding is difficult given the significant downsizing of the Defense budget. In fact, in the pass few years, we have accomplished a careful and balanced downsizing of Air Force S&T investments covering infrastructure, inhouse manpower, and contractual programs. Our S&T Program budget request for fiscal year 1996 is $1.4 billion (a 6 percent decrease from $1.5 billion in fiscal year 1995) and will provide a balanced S&T Program that addresses both near- and far-term Air Force warfighting needs. Our Basic Research program remains at $240 million while Exploratory Development dropped 3 percent to $672 million and the Advanced Development dropped 12.6 percent to $495 million. While the planned funding level has forced us to tighten our belts and be more selective than ever about investing in the "best" technological opportunities, it will still enable the Air Force to support a responsive program of critical basic research, exploratory development, and advanced development activities which will enable us to meet our responsibilities to the national security objectives of America.

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*The top five capabilities are: (1) to maintain near perfect real-time knowledge of the enemy and communicate that to all forces in near-real-time; (2) to promptly engage regional forces in decisive combat on a global basis; (3) to employ a range of capabilities more suitable to actions at the lower end of the range of military operations which allow achievement of military objectives with minimum casualties and collateral damage; (4) to control the use of space; and (5) to counter the threat of weapons of mass destruction and future ballistic and cruise missiles to the CONUS and deployed forces.

The core of our investment remains in Air Vehicles, Aeropropulsion and Power, Avionics, Sensors, Command, Control, Communications, and Intelligence, Human Systems, and Space Technologies. In addition to those areas emphasized in the S&T Programming Guidance, the Air Force investment strategy is currently focused on technologies that contribute to aircraft fleet enhancement, life extension, affordability of new systems developments, and space. Representative examples would include technologies for non-destructive inspections, corrosion control, avionics black box upgrades, software tools and manufacturing, and spaced-based demonstrations of advanced sensors, on-orbit propulsion, and satellite architectures. The Air Force S&T strategy remains the pursuit of a broad and balanced set of technologies that address the entire mission spectrum of the Air Force. Toward this end, Congress has consistently supported our approach of fielding technologically superior weapon systems.

CONCLUSION

By investing in a broad range of options, we are able to extract those technologies with the highest payoff and insert them into a modernized Air Force. This is an integral part of the long term investment strategy for the Air Force. The Air Force is committed to providing the advanced technologies needed to ensure the U.S. Air Force remains on the cutting edge of technology, performance, military flexibility, and affordability.

The superior weapon systems of today's Air Force and our sister services exist because of ideas and technologies that were developed by teams in our laboratories, universities, and defense contractors in the past. Future weapon systems are dependent upon the continuation of this successful legacy of innovative technology development, demonstration, and transition into present and future weapon systems. We are dedicated to maintaining technologically superior warfighting capabilities and a strong industrial base through a responsive technology transfer program.

As an integral part of the Defense S&T team, we look forward to working with Congress on these S&T issues of great military importance to the Air Force, the other services and agencies, and the Nation.

Senator SMITH. Let me just pick up on the line of questioning that we had with the previous panel and see if you could comment on this issue of the OSD accounts. If you could each comment briefly, because I am going to tick through a series of four or five quick questions here.

Do you feel the way that the program is shifting more toward OSD, that this is in any way negatively impacting your services and what you are trying to do? Just yes or no, each of you.

Mr. Secretary, how about the Army?

Mr. DECKER. Well, I do not think that is quite a binary answer, sir. We get frustrated sometimes. That is true in any large management enterprise. But I think in terms of the end objective—of really trying to make dual-use into a reality—OSD is on the right track, and I have the utmost respect for Dr. Perry.

I have known him for, God, I don't know. I helped him start a business. And I have worked with Dr. Kaminski. We are personal friends. And I really trust their integrity and judgment that they are going to let this thing play and manage it, and that they will push, if we have Technology Reinvestment Projects (TRP) and related programs or Advanced Research Projects Agency (ARPA), to produce results. If they don't, we ought to shut the program down. I know Paul feels that way.

So I am willing to concede that they are on the right strategic track, and it is a matter of execution efficiency. And if they pull it off, I think we will really see some benefits to the services.

So I am willing to support that until we see how it goes. Now, as the net result, we are sort of in a zero sum game in the total budgets, and I do not want to get off into that labyrinth.

So indirectly, it does cause pressure on that part of the RDT&E and science and technology program that is put into our hands to manage.

So it is up to us to make that the most relevant thing we can fund relative to our war fighting needs, and that is what we try to do.

I know that sounds like a waffling answer, but I do believe we have to find some way to get at the industrial base of the country. And if it is not TRP, it has to be something else.

I might have some criticisms on execution, because it is a young program, but I think Dr. Kaminski will straighten that out with time.

Senator SMITH. The same question to each of you; the same response, essentially?

Ms. SLATKIN. Senator, yes. I would like to revisit a thought that was brought out earlier if I may. So many of the technologies are common to all of the services, that developing them jointly in one arena really does reduce redundancy and duplication.

Now, whether you do it through a lead service or whether you do it through ARPA is a question that one could debate. But the reality is we have so much that is common here, we ought to take the advantage and provide some synergy. That is why I feel comfortable with the relationship between OSD and the three of us.

Mr. FIESTER. I agree with both Gil and Nora. I guess one point we should make here is the services are heavily involved with this program. We had over 100 Air Force people work with ARPA in putting that program together.

We are currently managing 25 of the programs under the TRP program. And as Dr. Kaminski mentioned, he does plan to have the full program reviewed by all three of us before putting it in place.

So it is not—you know, we are not just being decoupled from the TRP program. We are very much involved in it.

Senator SMITH. Let me start back with you, Secretary Fiester. What specifically is your input into the selection of programs and focus areas in the dual-use program of ARPA? Dr. Kaminski said that most of the OSD involvement was ARPA.

So that is a big chunk of what used to be your responsibility. How much input do you have in that decisionmaking process?

Mr. FIESTER. Well, we had the opportunity, working with Paul Kaminski and Noel Longuemare, to review the plans and to give our inputs on both the ARPA program and now the additional TRP program. We do have an opportunity to have a full review of that and give our evaluations and inputs to Dr. Kaminski.

Senator SMITH. Secretary Slatkin, the same question.

Ms. SLATKIN. The same response, Senator Smith. We have Navy people assigned to TRP programs. As Clark said, we manage several of them. We have good input. Your legislation last year that gave us $75 million and told us to establish focus areas was a big help in that regard. So yes, we have good input.

Mr. DECKER. I concur. Mr. George Singley, the Deputy Assistant Secretary for Research and Technology on my staff, is an intimate part of that review, and I concur.

Sometimes legislation can be strangulating, but I think the legislation last year—and nobody seems to disagree with it—that put us more in the loop of approval and managing the programs of TRP is going to help a lot.

Senator SMITH. Let's take the dual use programs that you would find in ARPA or the in TRP, in your opinion, starting with you, Secretary Decker, do you believe that these are sufficiently tied to the mission needs of your service?

Mr. DECKER. Most of them are in real technology areas. I would say in the sense that Dr. Kaminski gave you a couple of examples of things that are being invested in, such as the multi-chip module work, which is being sponsored through that program, another example might be work that has been on-going on the flat panel display.

Those are technologies that we need to keep a lead in, whether or not they mature in the civil sector. I happen to agree with Dr. Kaminski; they will. They always seem to.

More and more civil sectors are leading us, but where we see a need we must pursue it. I believe we will see needs in upgrading systems in the future.

Senator SMITH. So you see a link between the program and the mission.

Mr. DECKER. I do. I do, providing we pull it off and do not let these things turn into hobby shops. We have to produce results out of TRP.

Senator SMITH. Well, if you give up control, you will not have any control over whether they are hobby shops or not, will you?

Mr. DECKER. Well, perhaps we can use a little bit of free market principle, and I think time will tell. We will see needs for some of those technologies and upgrades of our systems.

If the technologies are there, our job is to turn them into the actual systems designs using the core technology. If they do not get anyplace, we will not use it.

Senator SMITH. Let me see if I can get the same answer out of the next two witnesses——

Mr. DECKER. Okay.

Senator SMITH. The same question, rather.

Ms. SLATKIN. I think Gil Decker said it nicely, but let me add two points. First, as I said in my statement, I do not believe we can expect 100 percent return on investment in all our S&T. Using that as a benchmark, I believe it is really important that we make sure that these projects are relevant in terms of military capability and in terms of affordability.

For example, the Power Electronic Building Block that I showed you, yields us great changes in circuit breakers, and has real military relevance. That effort was not only funded by the Navy, but also by ARPA.

That is a good example of what we are getting out of this kind of activity. I do not see how the three of us could sit here and tell you there is not real military relevance to that kind of effort.

Senator SMITH. All right.

Secretary Fiester, the same feeling or——

Mr. FIESTER. Yes, sir. If I could just give you two quick examples. At the Phillips Laboratory, we have a program under the ARPA/TRP doing a hydrostatic bearing development, which is going to provide, I think, major advantages in liquid fuel rocket engines, both for military and commercial applications.

And at the Wright Laboratory out at Dayton, Ohio, we are doing work on an electric actuation and control system program to develop electrically powered aircraft flight control surfaces and actuators, which will reduce maintenance and support costs, both for our military, as well as for commercial aircraft.

So these are just two of many examples, but I think we are following through to see that indeed these programs are of value to our warfighter applications.

Senator SMITH. A final point on this round, let me ask you this question: Do you see any difference in the level of your involvement as the services between TRP-related and ARPA programs? Is there any difference in the degree of involvement that you have, TRP versus ARPA?

Secretary Slatkin, I will start with you.

Ms. SLATKIN. As I said, I was accompanied today by Rear Admiral Marc Pelaez, the Chief of Naval Research. He is my representative that engages with the TRP application process. As each of us said, we manage a broad range of what ARPA is doing in the TRP. So for those activities that we manage, we basically see no difference.

Senator SMITH. TRP and ARPA, the same degree of involvement from your service. Do the other services feel the same way?

Mr. DECKER. If you are asking personal involvement, I think time will tell with these new rules that are being set up as a result of legislation. In the TRP, I rely very heavily on Mr. Singley, and he is a highly relevant guy. I am delighted to have him on our staff.

There are ARPA programs—I will give you an example of one—that probably relate more to military uniqueness. Because of the nature and magnitude of the system needs, I get involved with some personally, for example, the Army and ARPA joint program under the auspices of the Ballistic Missile Defense Office, a classified program, looking at a next generation seeker.

We have a good seeker now, but there are cases where we are going to need a better one. We can talk about a classified session. That is highly relevant. I get personally involved in that. We need that to pay off in the last half of the decade.

That is the nature of a program where ARPA and we are supporting a direct military need for the protection of the force. I have not personally waded into the TRP entities yet. I have great confidence in Mr. Singley.

I think as the next round comes up, we will be personally involved through these steering groups that have been set up.

So in terms of strategy, I think it is a good program. In terms of efficacy of execution and relevance, I think the next round will tell. And, you know, if you do not execute well, you do not have a good strategy. But I think we have to really give Dr. Kaminski a chance to make sure it executes well.

Mr. FIESTER. I agree with my colleagues here. Again, as I mentioned earlier, we had over 100 people from the Air Force that worked with ARPA in putting that program together. So we are very heavily involved with the program.

Senator SMITH. Senator Bingaman.

Senator BINGAMAN. Thank you, Mr. Chairman.

Let me review just one of the thoughts we had when we pursued the establishment of this TRP and see if you folks agree that it is still a valid point. I think the idea was that ARPA had a pretty good record of stopping things that were not demonstrating results, stopping programs.

They did not—ARPA has no laboratories like each of the services do, and they had been fairly ruthless in cutting off programs after a few years if they, in fact, did not seem to be getting them where they wanted to go.

Is that a reasonably accurate impression of our ARPA's record? Now, we do not know with regard to the TRP. It has only been in existence now a year or two. But my sense is that there was a pretty good record generally over the history of ARPA. Is that accurate or not, Mr. Decker?

Mr. DECKER. I do not think I have a hard database. So I will have to rely a little bit on anecdotes. In the businesses I have been in—a great deal of it has been in defense-related business, as well as commercial—I have always been around the high tech environment. And in the various things I have done, including my stint as chairman of the Army Science Board, I have known most of the ARPA, formerly Defense Advanced Research Projects Agency (DARPA), directors.

Dr. Bob Fossem some time ago, when Bill Perry was the Under Secretary, was a business colleague of mine and Bill Perry's. Dr. Bob Cooper and I did some business when he headed ARPA.

So I had a chance to really form some anecdotal evidence. I know under their tutelage, in those days, the attitude was: We need to take something far enough along to know if we have something good or not. And if we do, we need to spin it out to the services to pick up and move out with it.

Now, that is a technology transfer problem. It is also a hell of a big marketing problem. But the attitude of those directors, to quote two I know—and I have seen several projects—was that, they did not want to waste money.

And if they got to a point after 2 or 3 years on a program and they could not see definitive results, they were willing to say: Okay. Let's deviate from it.

And it seemed a little easier for them to kill a program than not. The hardest problem they had was, when they had some pretty good stuff, getting over the technology transfer culture barriers and the services picking it up, but that is true in any organization.

Bottom line, in the past, I think they have done a pretty good job of that. Now they are three times as big and what will happen.

Senator BINGAMAN. Right.

Is MMIC an example of that?

Mr. DECKER. What is that?

Senator BINGAMAN. Is MMIC—Secretary Slatkin was talking about the MMIC program. My understanding is that was started by our ARPA——

Ms. SLATKIN. Yes, sir.

Senator BINGAMAN [continuing]. And then transferred off to the services. Am I right about that, as an example?

Ms. SLATKIN. Yes, sir.

Senator BINGAMAN. Do either of the other two have a comment on the general ability of ARPA to cut things off when they are not producing results?

Ms. SLATKIN. I have no personal basis upon which to judge the history. Let me only say I think that Larry Lynn, the new Acting Director of ARPA, is going to do a fantastic job.

I believe that he is going to insist on making what they are doing highly relevant to our operational commanders, because that is what he has been doing for the last year and a half.

Mr. DECKER. I might add that Larry is a former deputy director of ARPA under Bob Cooper. So he knows the drill. I have the same regards she does. I think he will personally push that in.

Senator BINGAMAN. Secretary Fiester.

Mr. FIESTER. I have over 37 years on the industry side of this business and have worked many programs with ARPA for many years. And I certainly share that view. I think they—as Gil said, I think they have a shorter turning radius.

They are able to—when they see they are not heading down a fruitful path, they seem to have a better ability to be able to cut it off and get off the hill and put the funds somewhere else.

Mr. DECKER. I would like to comment on, or to reiterate something I said kind of tongue in cheek. ARPA has been a lean and agile organization. I think that is the message.

Senator BINGAMAN. All right.

Mr. DECKER. Now they are big. They are going to need lean and agile management, and I hope Larry brings that to them.

Senator BINGAMAN. Let me ask about this lean aircraft initiative, because I was—I got a little information about that, the one that MIT has the lead on.

It seems to me that that was a very good example of a dual defense-commercial initiative which holds out tremendous promise for our defense sector in savings and improved performance in a variety of things.

Secretary Fiester, would you have any more comments on that program, as to whether or not that is the kind of thing that you see some real promise in?

Mr. FIESTER. Yes. I think, again, if you look at some of the results they achieved, you know, that led to the book, "The Machine that Changed the World," and similarly the real contributions that I feel that they made to the automobile industry in production costs and quality. So I think they have a proven track record there, and they are applying that same methodology.

As you know, this is a joint effort with the Navy and also with industry. We have—some 22 of our major prime contractors who are members of this and make a small contribution each year, in addition to what we put into the program.

Their initial focus right now is on metrics, trying to lay out the metrics that we will use for measuring the performance of our production processes. And I think they are well along in having those defined.

They also have done some case studies. They went out to John Deere, who had done just a remarkable job in turning around their production operation of their entire business. British—one element at British Aerospace, another excellent example of a complete turnaround in the quality and the cost of production.

So we are trying to—right now, we are putting together metrics so we can know when we are improving and when we are making progress, and then we are trying to look at some existence theorems, basically some real life bases where major turnarounds have been accomplished.

But I guess we are very optimistic that this is going to have a big impact on the affordability of our systems.

Senator BINGAMAN. Did you have any comment on that, Secretary Slatkin?

Ms. SLATKIN. This is a real opportunity for us. Our next generation aircraft, the Joint Advance Strike Technology aircraft, is going to involve the Marine Corps, the Navy and the Air Force. It has to be affordable to build it in numbers the Navy is participating in this effort jointly with the Air Force. We are joined with, industry as well. It is a real opportunity to look at process control and to try and reduce cost.

Senator BINGAMAN. Now, Ralph Gommery testified to our committee a couple years ago about some of the Sloan Foundation's efforts to build an institutional capability at various universities, primarily, around the country and really looking at different pieces of the industrial sector needed to support our defense effort and saying that one of our problems is that we do not really have the in-house continuing capability to understand what those industrial sectors are.

And he was looking at semiconductors as one example, and maybe aircraft as another example.

Is that something that you see as a worthwhile thing to do? I know that foundation has made grants to different universities to try to, over a period of years, build up that institutional capability to understand and look at that, look at each of those industrial components more precisely.

Is that something that is useful? Would that be a good use of taxpayer dollars to support that same kind of an initiative?

Secretary Decker, do you have any thoughts on that?

Mr. DECKER. I am not familiar with that particular work. So I do not want to comment on it. But I will treat your question in a more generic fashion, if I understand what you are posing.

It is: Through research grants in the academic research field, is there an attempt to assess and maybe look for new, better definitions of industrial sectors and industrial base?

Senator BINGAMAN. And to define things, such as this lean aircraft initiative where significant forward progress can be made, both in the defense sector and the commercial sector, by pursuing a joint initiative in a part of our defense industrial base.

Mr. DECKER. I guess I would give a cautious yes, that could be extremely valuable. I base that on some experience I have had around Stanford, where, for a number of years, they had a chair—I knew the gentleman that filled it—called professor of manufacturing policy and methods.

Now, around Stanford, you sort of look down your nose at that kind of stuff, but this guy was really bright. And he did some real research, where he looked at methodologies and things called the focused factory.

And some companies began to really use his methodology to get more efficient. So there was an example where an academic environment sparked new thinking and led to some—this goes back about 15 or 18 years. And I was always very impressed with that work and watching it mature and find utility.

So if that paradigm fits, I think you could find some real utility in what you are describing.

Senator BINGAMAN. Okay.

Do any of the others have thoughts? Secretary Slatkin.

Ms. SLATKIN. Yes, sir. That paradigm fits. In fact, we are doing it at ARL, Penn State, on gears. We in the Department of the Navy believe this is a good idea and it is a good use of taxpayers' money for the reasons Gil described.

Senator BINGAMAN. Okay. Secretary Fiester, do you have any thought on that?

Mr. FIESTER. No further comment on that.

Senator BINGAMAN. Okay. My time is up. Go right ahead.

Senator SMITH. One more round here. Let me ask you all this question: Are all programs within the TRP relevant to your respective service missions? Yes or no? Secretary Decker.

Mr. DECKER. I am sorry. Would you repeat the question, sir?

Senator SMITH. Are all programs within the TRP relevant to your service mission?

Mr. DECKER. I do not know. When you say "all," I really do not know. I have not looked at it that carefully. I would be happy to come back to you with a more thoughtful assessment on that for the record, if you do not mind.

Senator SMITH. Let me put it this way for the record. If there are some that you feel are not, I would like to have that for the record.

Mr. DECKER. I will be happy to do that. And I will be candid when I give you my response, and give you my rationale.

Senator SMITH. Well, you know, the situation we are faced with TRP.

Mr. DECKER. I understand.

Senator SMITH. And if it comes to something in there that you feel is not relevant, I think you have an obligation to say so, because——

Mr. DECKER. I agree.

Senator SMITH [continuing]. It will help us to make decisions that we may be forced to make.

Mr. DECKER. I respect your question, and I will respond honestly.

Senator SMITH. And the same goes for each of you, if you wish to submit that for the record.

Ms. SLATKIN. Yes, sir.

[The information follows:]

The Technology Reinvestment Program is an important effort, that is very supportive of the services' interests. A majority of the programs are relevant to the naval mission. The following are examples of the many programs that we consider mission relevant:

— Fly-by-Light Advanced Systems Hardware.
— Autonomous Landing Guidance.
— Power Pak Mobile Electric Power System.
— The $2,000 Electric Powertrain.
— Advanced Power Conversion Based on the Aerocapacitor.
— LEGOS Program.
— Advanced "Zero Emission" Control Valve Development.
— Power Electronic Building Blocks.
— Analog Optoelectronic Module Development.
— Just-In-Time Maintenance.

The following programs are considered not relevant to the naval mission:

— Hybrid Technology Option Project.
— Advanced Automatic Train Control System.
— National Industrial Information Infrastructure Protocols.
— East/West Consortium: Next Generation Authoring Tools & Instructional Applications.
— Gamma Ray Imaging System for Nuclear Environment Monitor.
— Air Quality Monitoring System Using a Neural Network Based Fouirer Transform Infrared Spectrometer.
— Low Cost Packaging Technology for Automotive Electronics.
— Low Cost Electronic Packaging through Systems Approach to Ball Grid Array.
— Low-Cost Plastic Packaging.
— Advanced Composites for Bridge Infrastructure Renewal.

RELEVANCE OF TRP TO THE ARMY MISSION

Technology Reinvestment Project (TRP) awards have been made in three categories: Development, Deployment, and Manufacturing Education and Training. Relevance to Army needs varies by category. Of the 97 active TRP Development awards, 47 (48 percent) are relevant to Army Needs. None of the 95 funded Deployment projects have, at most, tangential relevance to us. The Army is supportive of Dual-Use Technology Development for future requirements, but the 48 percent Army relevancy in this category suggests that more direct Army involvement is required in developing the technology focus areas to be competed in the future.

Senator SMITH. Secretary Decker, I do not mean to pick on you. You mentioned a few minutes ago your friendship with Secretary Perry. Is a $500 million hit in your account straining the friendship, or is it——

Mr. DECKER. Oh, yes. Yes, sir. [Laughter.]

Senator SMITH. I mean, I am looking at the 6.1, 6.2, 6.3, and the infrastructure accountents totalling about $535 million maybe. You probably added it up.

Is all of that being made up in the ARPA program? Is that where that is all going?

Mr. DECKER. I have not quite thought of it in those terms. I mean, you have bottom line dollars and budget guidance, and you construct the program according to that. And somebody else has bottom line dollars in another part of the budget guidance.

And I guess as you observe it externally, if you will, it looks like this came down by "X," and this went up by "Y." I have not quite made that traceability.

I came into the job last April and got sworn in and was right in the middle of the fiscal year 1996 budget programming and the

Planning, Programming Budgeting System (PBBS) is a wonder to behold.

But I rapidly got up to speed, and there was a terrible problem in the Army's budget. For example—and I am going to get to your question, but this is the environment that drives it.

The original budget guidance for the Army Total Obligation Authority (TOA) for everything in the Program Objective Memorandum (POM) cycle before the final budget submission had reduced the Army's bottom line or top line, if you wish to call it that, from a fiscal year 1995 budget request, because fiscal year 1995 was not fully approved at that time, although we ended up close to the budget request.

But assuming the fiscal year 1995 budget request would come through in the final budget, the guidance was down from $61-plus billion in fiscal year 1995 to $57 billion in fiscal year 1996. That is a $4 billion hit in budget guidance.

And there were some other details about protecting certain elements of the science and technology program. But when the enterprise takes a hit that heavy, it creates a great strain on everything from friendship to analysis to whatever.

And the Army had to package, because the Army generally is a good soldier who salutes the boss, had to package their submission into OSD to fit $57 billion of budget guidance.

And that created a severe element of modernization pause that I described earlier to try to support the Army's broader leadership in fixing the readiness, sustainment and quality of life base.

Now subsequently, as you well know, because you have the budget, that was amended somewhat, and the Army's budget request for 1996 went up to a bit over $59 billion, $59.5 billion, for the total.

But most of that adjustment upward, in fact all of it, went into the near-term readiness, sustainment, and modernization accounts. And, in fact, the ultimate total RDA budget for the Army came down a bit from the POM request.

When you are faced with that kind of thing, you have your guidance and you package it up. And it has been a real strain. So we are running awfully thin.

Senator SMITH. I would like to see at some point for the record before we get the budget process completed what areas, if any, you feel, in terms of the longer term, rather than the short-term readiness, the longer term needs, are critical to you or maybe critical to you in terms of those programs in the 6.1, 6.2, 6.3 accounts that have been cut or reduced.

Mr. DECKER. Okay.

Senator SMITH. I will not ask you to do it now, but I would like to——

Mr. DECKER. Okay. We will take that for the record.

[The information follows:]

LONG-TERM FOCUSED SCIENCE AND TECHNOLOGY FISCAL YEAR 1996 REDUCTIONS

The Science and Technology (S&T) program did sustain some cuts on long- term needs as the result of fiscal year 1996 funding restraints.

If additional fiscal year 1996 funds were made available, I would apply them to warfighting needs as follows: Increase the level of effort on smart munitions to (1) accelerate the guided rocket for the Multiple Launch Rocket System (MLRS) to coincide with fielding of the extended range MLRS, (2) fund an evaluation of the Low

Cost Anti-Armor Submunition (LOCAAS) seeker in captive flight testing, and (3) accelerate the Precision Guided Mortar Munition (PGGM); accelerate the survivable Armed Reconnaissance (SAR) program, which has been proposed as an Advanced Concept Technology Demonstration; accelerate the Counter Active Protection System (CAPS) to reduce tactical missile susceptibility to threat active protection systems; enhance transition opportunities for vetronics by accelerating the Crewman's Associate Advanced Technology Demonstration; accelerate Stinger Block II fielding; and accelerate on the move sensor fusion capabilities for Comanche and Longbow Apache through the Multi-Sensor Aided Targeting-Air Advanced Technology Demonstration.

Additional fiscal year 1996 funds would also be used to restore funding cut from the Advanced Concepts and Technology (ACT) II program. ACT II provides critical support for the Battle Labs and the Louisiana Maneuvers Task Force to evaluate mature technologies from industry and academia as solutions to warfighting problems. Restoration to the Future Technology Program (FTP) will accelerate mature electric armament technology for the future main battle tank.

From fiscal year 1994 to fiscal year 1996, Manpower, Personnel and Training (MPT) 6.2 funding dropped from $14 million to $7.5 million, while MPT 6.3 funding dropped from $8.5 million to $5 million. Clearly, the magnitude of these cuts has hurt our advance in human resource technologies.

The following restorations would have a significant impact on the MPT program: (a) research that is developing methods to improve individual soldier training, focusing on the use of virtual reality technologies to deliver higher quality training at lower cost, and (b) efforts to design strategies for long-term development of leadership competencies, with a focus on Battle Command and Force XXI leadership skills. Also restore research efforts to develop prototype training support packages for Armor and Aviation on the digitized battlefield and for Force XXI.

The Army's Environmental Quality Technology Program was also severely cut from approximately $17 million in fiscal year 1995 to approximately $8 million in fiscal year 1996. The impact of this cut can best be shown in two environmental cleanup technology areas. First, the impact of delaying further development and transfer of bio-remediation, a cheaper method of treating explosive contaminated soil, can easily exceed $50 to $100 million over the next several years. Second, cuts which have resulted in a 2 to 3 year delay in developing explosive sensors for the Site Characterization Analysis Penetrometer System (SCAPS), which could reduce by two thirds the costs to characterize a contaminated site, will cost the Army an additional $10 to $20 million per year.

Mr. DECKER. I will make a general comment on that, if I may, a process comment more than numbers.

I really would like to take a moment to pat George Singley and the crew on the back in what they have built-up over the last 2 or 3 years independent of the budget guidance.

In the Army's science and technology base, which is 6.1, 6.2, and 6.3, the entire focus, as you heard Mr. Fiester and Ms. Slatkin say about their efforts, the entire focus within the Army is on relevance to the warfighter.

There is a process I will not take you through in detail that culminates in the Army Science and Technology Master Plan that is updated annually. It spells out every project. I have a copy of it here.

But before this is published, it goes through several steering group reviews by different elements of the Army wearing green suits with lots of experience, and it culminates in a final review with a four star advisory group, chaired by the Vice Chief of Staff of the Army.

I am the co-chair on that; they have ample time to review the plan. And they comment. Sometimes they do not have the background to understand the technology nitty gritty, but we try to spell it out.

Here is where it can lead, and this is why we are doing it. So this is how it fits. And they certainly understand the relevance. So it does not get in the plan until it is stamped with the Good Housekeeping Seal of Approval (SA and GSA).

So whatever our budget is, I really believe that, due to the diligence of that process, everything we do is highly relevant.

That is not the question you asked. I think our process says our 6.1, 6.2, 6.3 has no wasted motion in terms of the projects we are supporting. In terms of things where we might have some holes, I need to think about that, and I will get back to you with a question for the record.

Senator Smith. I think in your case, Secretary Slatkin, it is not as dramatic, but you are looking at roughly $165 million. And you indicated in your statement that you thought the Navy's recapitalization plan is on track.

In spite of those numbers, in spite of those reductions in 6.1, 6.2, 6.3 accounts, do you still feel that way?

Ms. Slatkin. Senator, yes. The process that Gil described in the Army is the process we use in the Department of the Navy. It is a process where we engage the fleet CINCs, and the CNO and the Commandant in what we are doing in terms of science and technology.

When you look at what we have done here compared to last year, we are looking at roughly $100 million reduction compared to last year's levels in 6.1, 6.2 and 6.3.

But, if you look over our entire program, our 6-year program, you see that we maintain an adequate level in science and technology, and you see that we have a recapitalization program that provides long term support for the warfighter. That is the basis upon which I make my statement.

Senator Smith. If there is anything, I would pose the same question to you for the record. If there is anything in there that you feel ought to be looked at again or is critical, we would like to hear from you on that.

Ms. Slatkin. I appreciate that.

[The information follows:]

Programs impacted by university research reductions include: high frequency acoustics techniques relevant to weapons effectiveness in littoral environments; offboard weapons and towed sensors in undersea surveillance programs; advanced double hull technologies; advanced diesel technology; joint service programs in communications and data transfer; threat missile data base for infrared signatures; atmospheric and environmental effects on electro-optic and electromagnetic sensors; advanced countermeasures techniques for fleet radar receivers; passive missile warning system integration; wound healing and septic shock; liposome encapsulated hemoglobin; environmental stressors and laser eye protection; condition based maintenance; inspection for composite engine applications; and in situ identification of toxic marine sediments.

Programs impacted by Supplemental action include: integrated high performance turbine engine technology; avionics research; and the helmet mounted mission rehearsal simulation system.

Exploratory development programs impacted by reductions include avionics systems for the insertion of digital technology into analog/digital airframes; logistics research, including increased efforts in amphibious support and logistics over the shore; and, the exploratory and advanced development of "smart" undersea weapons for undersea battle space cooperative engagement.

Senator Smith. Secretary Fiester, I think mum is the word for you, don't you, after looking at your numbers? You probably would just as soon not saying anything, would you not?

Mr. Fiester. That is right. [Laughter.]

Senator SMITH. Just one final question from me, and that is to Secretary Slatkin on a totally different matter.

When you testified and you had a chart up there, you were talking about something that kind of piqued my attention. And that was reference to an Advanced Technology Demonstration Programs dealing with mine detection, as well as anti-submarine warfare, especially with the submarines being proliferated.

Are you aware of the specific ATD–111 program? It has quite an amount of potential in both anti-submarine warfare and counter mine operations.

It is my understanding that the Navy has not chosen to fund that. If that is not correct, could you update me as to what the status of the funding is on that program?

Ms. SLATKIN. Sure. As I understand, it is a laser mine detection system.

Senator SMITH. Right.

Ms. SLATKIN. I must say, I am not aware of the details. Let me get back to you, please, with more information on whether ATD–111 has been funded or not. We had a lengthy discussion last year.

Senator SMITH. Whether it has been funded, what the priorities of that programs are, and your feelings in terms of its capability for the future.

Ms. SLATKIN. I would be happy to do that.

[The information follows:]

The funding status for ATD–111 is as provided below for a scheduled program completion in fiscal year 1995:

Fiscal year 1989, $2,642,000; fiscal year 1990, $9,299,000; fiscal year 1991, $12,209,000; fiscal year 1992, $10,000,000; fiscal year 1993, $12,983,000; fiscal year 1994, $13,999,000; and fiscal year 1995, $4,756,000.

Total funding for the ATD–111 program is $65,888 thousand. However, unscheduled costs growth and minor technical problems will not allow for final testing within the fiscal year 1995 time frame. In coordination with the Office of the Secretary of Defense, a joint program is being developed with the program manager for the Office of Secretary of Defense Non-Acoustic ASW Program to provide additional funds to complete system integration and testing of two ATD–111 systems in fiscal year 1996 for use by the ATD–111 and OSD program offices. Future joint testing between both program offices is also planned if continued funding becomes available.

The ATD–111 program priorities are:

(a) Complete fabrication and integration of the advanced receivers.

(b) Complete integration, calibration and laboratory testing of the two ATD–111 systems.

(c) Conduct airborne shakedown testing of the ATD–111 systems.

(d) Conduct controlled submarine detection and classification tests on an instrumented range.

When completed for testing in fiscal year 1996, the ATD–111 system will have the capability to detect and classify both submarine and mine-like targets. Classification will not be automatic but will be determined by the system operator. The ATD–111 system has been designed to be pod-mounted and will have the capability to be compatible with the SH–60B, SH–60F, SH–2, P–3C and S–3B aircraft.

Senator SMITH. Senator Bingaman, do you have any further questions?

Senator BINGAMAN. Let me just do one follow-up here. I want to just clarify in my own mind.

Secretary Decker, I can understand how friendships get strained when you are told you only have $57 billion. But I think there is an impression, perhaps, that the Secretary or Office of the Secretary of Defense said: Reduce your R&D funding at the Army level so that we can increase it at OSD's level. That did not happen, did it?

The funding level you have for R&D at the Army level is pretty much a decision that was driven by the priorities that the Army had to maintain readiness, sustainability and to put modernization and R&D on hold for 2 years, essentially put it on the back burner and not fund it at a robust level during that 2-year period. Is that not what I have heard you say?

Mr. DECKER. That is right. Now, that was not in defense driven guidance. The broad guidance and the TOA obligations were there. There was guidance to try to maintain the S&T component, 6.1, 6.2, and 6.3——

Senator BINGAMAN. Right.

Mr. DECKER [continuing]. At a zero percent real growth. We had to break that somewhat. But it was driven by the total envelope looking at the Bottom-Up Review (BUR) force structure—that is an Army-wide issue—the needs of op tempo and Operating and Maintenance (O&M) to support training and the readiness goals.

Those were very clear. They did state in the defense guidance, you know: Thou shalt remain ready. Thou shalt support essential quality of life.

So that forces you into a box. But the percentage cut that you take at the top line—I do not know what the arithmetic behind the scenes was.

But there were no explicit things that said, "Okay. Now what we want you to do is whack your S&T budget, and we are going to slide it up to OSD."

That is why I say I cannot make that relationship unless it happened behind——

Senator BINGAMAN. Because there really is a cut at the OSD level, too, is there not? Am I confused?

Mr. DECKER. I do not——

Senator BINGAMAN. There is something that is $108 million cut at the OSD level, according to the figures I have here in the 6.1, 6.2, and 6.3 accounts.

Mr. DECKER. Do you mean when you sum it all up?

Senator BINGAMAN. Yes.

Mr. DECKER. I assume. I just do not have that answer on the tip of my tongue.

Senator BINGAMAN. Okay.

Mr. DECKER. But I think it is accurate to say we were handed a bowl of nuts and told to divvy it up the best we could.

Senator BINGAMAN. Right. And I understand that that puts real pressure on the S&T budget, as well as everything else. But there was not a directive out of OSD: Cut S&T in order to fund the other stuff. It was: Keep a zero percent real growth in S&T.

Mr. DECKER. In S&T, which means kind of keep it up with inflation——

Senator BINGAMAN. Right.

Mr. DECKER [continuing]. And then figure everything else out. I am oversimplifying.

Senator BINGAMAN. Right. And that was not possible in the case of the Army because of all the readiness needs.

Mr. DECKER. In my honest judgment yes, but I do not want to speak for the Chief and the Secretary and the Deputy Chief of Staff for Operations and Plans (DCSOPS). I work with them closely. But when you take that big a hit in the kind of draw down we are doing and try to maintain readiness, it left us on very thin ice.

Senator BINGAMAN. Right.

Mr. DECKER. And so we had to do what we did.

Senator BINGAMAN. Okay.

Mr. DECKER. I did not like it. As I said in my opening comments, we cannot do this modernization pause too long.

Senator BINGAMAN. All right. I understand.

Mr. DECKER. We are on thin ice if we do not get it moving in the next year or two.

Senator BINGAMAN. I understand, and that is exactly what Secretary Kaminski said, as I understood him, that you are on thin ice. That seems to be a phrase we hear a lot around here.

Mr. DECKER. It is not broken yet, but spring is coming, and it melts.

Senator BINGAMAN. Thank you very much, Mr. Chairman.

Senator SMITH. I would thank the witnesses for coming this afternoon. We appreciate your testimony. We will leave the record open for the benefit of other members, if they have questions to submit for the record, until 5 o'clock on Thursday.

Mr. DECKER. Thank you very much, sir.

Ms. SLATKIN. Thank you.

Senator SMITH. The meeting is adjourned.

[Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR BOB SMITH

ARPA ORGANIZATION AND ROLE

Senator SMITH. Dr. Kaminski, over the last several years, another trend has been the growth of ARPA from an agency with a $1 billion budget to one with a budget of $2.5 billion. One factor in that growth has been the flexible authority to enter into innovative contractual relationships unburdened by the usual requirements in the Federal Acquisition Regulations. Some have raised concerns that ARPA's rapid growth and the broadening of its responsibilities has also detracted from its original character as a small organization quickly able to develop technologies in response to the needs of the services. How do you see ARPA's organization and role evolving over the next several years? Have we burdened ARPA with too many missions for it to preserve its essential character?

Dr. KAMINSKI. ARPA was designed to be a small, flexible, innovative organization. It has grown large enough. I do not anticipate any expansion of people, programs, or budget for ARPA and urge that no more functions be added by legislative action. Even though larger than in the past, the current size and character still permits the flexibility and innovation that has been so successful in the past. Larry Lynn, the current Acting Director, intends to review the agency's investment strategy and programs over the next few months to insure that they are properly focused and may move to start a shrinking trend, but I doubt that we will see a major shift in strategy. The agency will continue to play a major role in high-risk, high-payoff technology, and in those serious technical problems that require a sustained effort over time for solution. And, of course, they have a fundamental responsibilities to apply their technological developments to meet the needs of the warfighters.

TECHNOLOGY BASE PROGRAMS

Senator SMITH. Dr. Kaminski, my preliminary review of the technology base programs, including RDT&E support, under the jurisdiction of this subcommittee indicates that the request for fiscal year 1996 is about $1 billion below the $10 billion appropriated for the current fiscal year. What does this $1 billion reduction represent? What activity from this year will we lose if we approve the budget as requested?

Dr. KAMINSKI. The fiscal year 1996 Science and Technology (S&T) budget request is approximately $1 billion below the fiscal year 1995 appropriated S&T budget. This reduction represents approximately:

- $800 million of unrequested programs added by Congress in fiscal year 1995 which are not contained in the fiscal year 1996 budget such as in the areas of medical, simulation, environmental, and industrial preparedness.
- $200 million of a number of service and Defense agency programs within the technologies of weaponry, computers, electronics, and material processing which were reduced either because of budget constraints or terminated due to program completion or cancellation.

SCIENCE AND TECHNOLOGY

Senator SMITH. Dr. Kaminski, as I have stated in my opening statement, the technology base programs may be under great pressure because of the desire to address short-term readiness concerns within a limited budget. I am willing to grant for the sake of argument that the administration has carefully weighed the programs in the President's request before sending it to us, but reductions from that request may be forced on us. If that scenario occurs, what are the four or five activities, initiatives or programs that we must strive to protect to the greatest extent? What is your basis for determining these priorities?

Dr. KAMINSKI. The fiscal year 1996 Science and Technology Program budget request is the minimum level required to meet tomorrow's warfighting needs.

Our highest priority technology efforts are those associated with and supporting sensors, information, and modeling and simulation. The capability to acquire huge volumes of information, process it and pass it onto the warfighters in the battlefield in near real time will change the character of war. The forces that obtain and disseminate the most accurate information needed by field commanders will have distinct advantages over all adversaries. Sensors provide data about objects or physical phenomena of importance on the battlefield. To know more, and to know it sooner, is to have the advantage. Sensors applications include situational awareness, target identification and discrimination, and targeting. Information technologies enable better performance of current platforms, weapons, sensors, and people. Information technologies are a military asset that must be protected. Their vulnerabilities, failure modes, and robustness must be understood in order to defend them and to exploit their vulnerabilities to military advantage. Modeling and simulation can provide very powerful tools that have a myriad of high payoff applications. It is a very cost-effective means of maintaining readiness, evaluating high payoff potential of new technologies, augmenting test and evaluation and in developing operational tactics and doctrine.

TECHNOLOGY BASE

Senator SMITH. Dr. Kaminski, by the same token, if we are able to free up more resources for the technology base, where are the areas of greatest additional need or potential payoff?

Dr. KAMINSKI. The Technology Base request represents the optimum program the Department can support considering its overall mission requirements and the budget restraints facing this Nation. The program reflected in the President's budget request has been structured to address high priority needs within the constraints necessitated by the current fiscal environment. Additional resources, if available, would be used to increase the level of effort in high-risk, high-payoff areas, and to place greater emphasis on exploiting technology to improve logistics and ownership costs.

BASIC RESEARCH

Senator SMITH. Dr. Kaminski, do you agree with an approach that uses relevance to national security as the basic litmus test in reviewing the programs in the Defense Department budget request? Does that fundamentally differ from the approach that you and others used in putting the budget request together? If you agree with the soundness of that approach, what are your thoughts on how we best apply it to the 6.1 basic research accounts, say in the University Research program, or when looking at the dual-use programs in the OSD budget as some argue that these are cases of spending defense dollars for non-defense purposes?

Dr. KAMINSKI. Military relevance is at the core of the Department of Defense (DOD) basic research. All programs are reviewed using two criteria: relevance and merit. Because the mission of defense research is to improve future warfighting capabilities, we defer to other agencies good science that we don't need to do.

Recently, scientists in the Army created the apt expression "Owning the Night," thus capturing the thought that the United States has the world's best night vision equipment. The phrase expresses most effectively the goal of the DOD Science and Technology Strategy: superiority. Ownership implies control and leadership, not equality. Equality means buying Exocet, Leopard, Silkworm and Scuds. Every nation with money can do that. Superiority means buying the F–117 Stealth Fighter, Laser Guided Bombs, the Global Positioning System, and "Owning the Night" with thermal sensors and night goggles. Only one country has been able to do that, and it was accomplished because of major discoveries in DOD basic research.

By its very nature, research can apply to many problems in many sectors. As a result, it is easy to report that defense basic research is largely dual-use. There are numerous, well-known examples of how defense-initiated research efforts have spawned major industries. The laser, Internet, and Global Positioning System are just three examples. However, in every one of these cases, defense research funding was spent with the expectation that at least one new warfighting capability would result. Sometimes it wasn't the one we expected, but that is the nature of research.

The above comments apply as well to our recent dual-use initiatives. These programs are motivated by the concept that good research and development can impact both the military and civilian sectors and, in particular, by the recognition that the DOD must have access to the capabilities of commercial companies in order to ensure the affordability of future warfighting equipment. The Department needs to encourage the development of defense and commercial technologies along parallel paths so that upgrades introduced to dynamic commercial markets are usable for DOD systems as well. As always, military relevance is the prime driver.

TECHNOLOGY BASE PROGRAMS IN DOD

Senator SMITH. Dr. Kaminski, you have described the importance of continuing the reform of the acquisition process to allow us greater access to technologies developed for the commercial marketplace. You have solicited our support for further reform efforts to include favorable consideration of the recent legislation proposed by the administration. What additional support can we give you in your efforts other than passing new legislation? We have been told repeatedly by many people that the source of major reform is not to be found in legislation, but in the Department of Defense making internal changes independent of legislation.

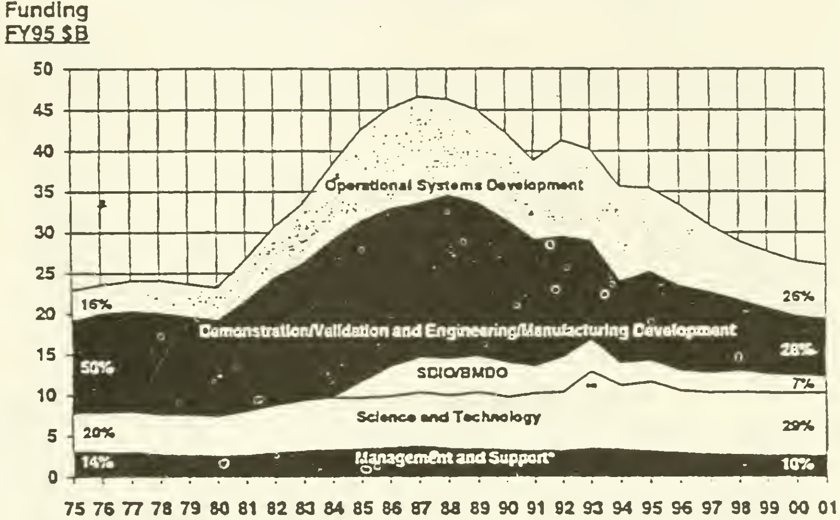
Dr. KAMINSKI. The Department is committed to acquiring cost effective and high quality products including those able to incorporate advanced, state-of-the-art commercial technology. Passage of the Federal Acquisition Streamlining Act of 1994 facilitated overcoming the institutional barriers to provide us the opportunity to effect a concurrent change in the culture. We are vigorously pursuing implementation of that bill as well as pursuing all avenues for reform in the DOD. Not only will the Department be implementing a completely new regime for the acquisition of commercial items and technology but also one for a new simplified acquisition procedure, as well, which makes use of electronic commerce and electronic data interchange to facilitate streamlining of the process. You can provide us further support by continuing to endorse all of our reform efforts, both legislative and internal management.

RDT&E FUNDING

Senator SMITH. Dr. Kaminski, the relative share of the technology base funding devoted to maintenance and modernization of the RDT&E infrastructure is growing. For example, in the Air Force request for fiscal year 1996, the amount for the Science and Technology program declined while the amount for RDT&E support increased. The Army substantially reduced its investment in S&T in the fiscal year 1996 while only slightly reducing its RDT&E support line. It will be more difficult to recommend a budget for technology when it appears that a higher and higher proportion of the funding is paying for the infrastructure maintenance rather than program execution. The unfortunate outcome of this perception is that we may be driven to a short-term approach of cutting infrastructure funding annually without arriving at a rational longer-term solution. Are you comfortable with this state of affairs? Is the problem only one of appearances?

Dr. KAMINSKI. Yes, it is a problem of appearances. To get a proper perspective on this comparison of Science and Technology (S&T) funding and the Management and Support (M&S) funding, it is necessary to take a longer term view. In the late 1970s, prior to the 1980s defense buildup, the M&S funding was about 12 percent of the RDT&E budget and the S&T funding was about 20 percent. Excluding the ballistic missile defense program, by 1996 the S&T program funding comprises 22 percent of the RDT&E budget and M&S comprises 9 percent. As the RDT&E budget further contracts in the out-years the S&T funding will stay level in real terms and increase as a percentage of the RDT&E budget to 29 percent. During this same period the M&S funding declines in real terms but increases from 9 to 10 percent of the budget. These trends are shown on the attached graph. I am very comfortable with this state of affairs. With this subcommittee's help we will work to make the out-year plans come to fruition.

TRENDS IN CATEGORIES OF RDT&E FUNDING - CONSTANT 1995$
(SDIO/BMDO FUNDING TREATED SEPARATELY)



* Includes Test and Evaluation Related (Infrastructure, Investment, OT&E, Base Support, etc.) comprise about 70% of management and support.

** Congress added about $2B to S&T during Appropriation process.

BRAC CHARACTERIZATION

Senator SMITH. We had been told that the BRAC would begin to deal with this issue, but the Dugway Proving Ground is the only facility on the list. How would you characterize various efforts like the BRAC or Project Reliance to deal with this issue?

Dr. KAMINSKI. Both efforts have been successful. The Secretary's recommendation to the BRAC contains 13 laboratory activities (one Army, nine Navy and three Air Force) recommended for closure as a result of BRAC 95. Detachments or components of five other Navy lab activities are also being closed. The attached matrix shows personnel reductions that will accrue through force structure reductions and BRAC recommendations.

Project Reliance has also been successful in reducing infrastructure by reducing overlap and redundancies among the services. It has identified 31 technology areas, plus basic research, that are of importance to two or more Reliance participants, and has brought activities in each of these areas under joint planning. Of the 311 Technology Topics considered by Reliance, all but one are categorized as either joint effort, collocated or consolidated. This represents a marked decrease in the number of topics conducted under separate funding at separate sites.

Some of the laboratories being closed also perform Test and Evaluation (T&E) activities. However, in addition to these laboratory activities the BRAC and Project Reliance, combined with increasing budget pressures, have resulted in closures and realignments for our lower priority T&E facilities and organizations. Such actions have resulted in a 30 percent decline in RDT&E T&E infrastructure funding since 1990. Project Reliance and BRAC (including the Secretary of Defense's most recent recommendations) will result in the following closures and realignments in addition to those mentioned earlier.

Army:

— Jefferson Proving Ground—Close
— High Energy Laser Systems Test Facility—Close MIRACL
— Dugway Proving Ground—Downsize
— Army Commodity Test and Evaluation Boards—Eliminate
— Army Cold Regions Test Center—Caretaker Status
— Electronic Proving Ground—Consolidate Management under White Sands Missile Range
— Fort Hunter-Liggett—Eliminate T&E mission on-site

Navy:

— Naval Air Propulsion Test Center—Close
— Barking Sands—Transfer to training mission
— Marine Corps Test Directorate at Twenty-Nine Palms—Close
— Naval Air Warfare Test Centers—Consolidate to two organizations

Air Force:

— 4950th Test Wing—Disestablish
— Utah Test and Training Range—Transfer to training mission
— TRESTLE Electromagnetic Facility—Close
— Electromagnetic Test Environment—Consolidate to similar site
— AFEWES and REDCAP contractor operated facilities—Close
— Large Aircraft Modification Electromagnetic Test Facility—Eliminate and move to mission development test centers.

BRAC 95 Laboratory and Acquisition Command Reductions

		FY-96 Employees			Force Structure Red'n#			BRAC Eliminations#				Total Reductions#				Total Savings ■ (FY95 $M)
		Off	Enl	Civ	Off	Enl	Civ	Off	Enl	Civ	Tot	Off	Enl	Civ	Tot	
ARMY	• ATCOM	163	64	3371	0	0	74	25	19	1022		25	19	1096	1140	453
	Total Army	163	64	3371	0	0	74	25	19	1022	1066	25	19	1096	1140	453
NAVY	NSWCCD, Annapolis	2	0	725	0	0	307	1	0	138		1	0	445	446	175
	NMRI Bethesda	56	160	193	0	0	0	8	41	27		8	41	27	76	111
	• NAVMASSO	11	92	287	0	0	0	2	4	15		2	4	15	21	35
	NAWCAD Indianapolis	9	25	2852	0	2	240	8	0	1028*		8	2	1268	1278	540
	NUWC Keyport, WA	18	132	2573	7	107	561	0	0	28		7	107	589	703	30
	NAWCAD Lakehurst	59	341	1944	-4	5	342	35	248	547*		31	253	889	1173	359
	NSWC Crn Div Louisville	5	11	1607	1	0	300	4	0	437		5	0	737	742	**
	NUWC New London, CT	2	10	999	0	7	520	2	3	58		2	10	578	590	91
	NBL, New Orleans	4	11	37	0	0	0	1	11	37		1	11	37	49	42
	NISE East, Norfolk	4	12	348	3	7	295	0	0	0		3	7	295	305	30
	NISE West, San Diego	1	6	909	0	0	118	0	0	60		0	0	178	178	60
	NRL Orlando	0	0	100	0	0	0	0	0	45		0	0	45	45	30
	NHRC, San Diego	10	7	58	0	0	1	3	2	10		3	2	11	16	11
	NPRDC, San Diego	4	13	154	0	0	0	1	5	5		1	5	5	12	15
	NAWCAD Warminster	2	14	311	0	0	17	1	10	82		1	10	99	110	105
	NSWCDD White Oak	5	3	777	4	3	645	1	0	66		5	3	711	719	66
	• CNR	35	4	419	0	0	0	0	0	0		0	0	0	0	0
	• NAVSEA	316	70	4144	21	2	671	1	0	67		22	2	738	762	144
	• SPAWAR	179	24	1031	2	0	156	43	4	358		45	4	514	563	350
	Total Navy	720	935	19458	34	133	4173	109	329	3006	3444	143	462	7179	7784	2314
AF	Rome Laboratory	84	48	786	74	48	-137	0	0	50		74	48	-87	35	96
	• Brooks AFB	640	999	1766	-188	-129	101	38	201	154		-150	72	255	177	142
	Williams AFB	5	10	24	0	0	0	0	0	0		0	0	0	0	21
	Total Air Force	729	1055	2576	-112	-83	-36	38	201	204	441	-78	118	168	210	261
	TOTAL DoD	1612	2074	29006	-78	50	4211	170	549	4232	4951	92	599	8443	9134	3028
	Labs Only	264	801	14407	85	177	3209	63	321	2616	3000	148	498	5825	6471	

All unsigned numbers are reductions; negative (-) numbers are increases.
• Personnel reductions are not from laboratories but from acquisition commands or headquarters
* Includes "no salary savings eliminations": 601 at Indianapolis, 333 at Lakehurst
■ Twenty year net present value at 2.75%
** Included in NAWC Indianapolis

SERVICE EFFORTS AT CONSOLIDATION

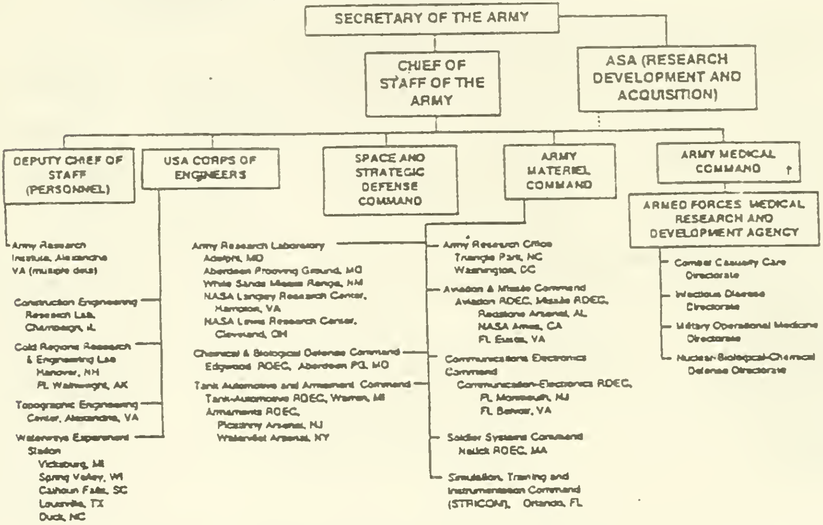
Senator SMITH. How do you assess the individual services efforts at consolidation over the past several years?

Dr. KAMINSKI. The services have made significant efforts to reduce their infrastructure burdens in RDT&E. Attached are charts for each service that show their laboratory structure in the mid 1980s, 1995, and after BRAC 95 and medical consolidations are effected. Comparison, for each service, of the mid-1980s chart with the "After BRAC and Medical Consolidations" chart reveals that considerable reductions in the number of laboratories and facilities have been achieved.

Test and evaluation facilities have undergone similar reductions as mentioned earlier.

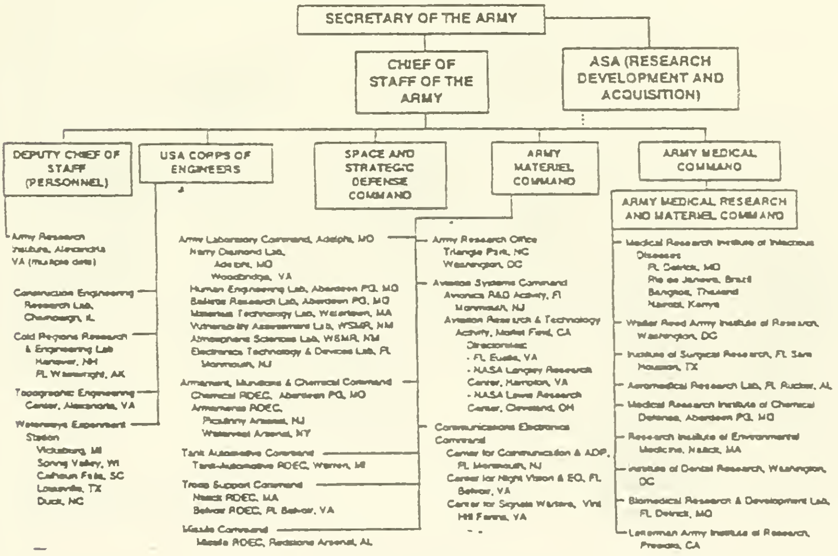
ARMY ACQUISITION STRUCTURE

AFTER BRAC AND MEDICAL CONSOLIDATIONS


SECRETARY OF THE ARMY
CHIEF OF STAFF OF THE ARMY
ASA (RESEARCH DEVELOPMENT AND ACQUISITION)
DEPUTY CHIEF OF STAFF (PERSONNEL)
USA CORPS OF ENGINEERS
SPACE AND STRATEGIC DEFENSE COMMAND
ARMY MATERIEL COMMAND
ARMY MEDICAL COMMAND †
ARMED FORCES MEDICAL RESEARCH AND DEVELOPMENT AGENCY
Army Research Institute, Alexandria VA (multiple dets)
Construction Engineering Research Lab, Champaign, IL
Cold Regions Research & Engineering Lab
Hanover, NH
Ft. Wainwright, AK
Topographic Engineering Center, Alexandria, VA
Waterways Experiment Station
Vicksburg, MS
Spring Valley, WI
Calhoun Falls, SC
Louisville, TX
Duck, NC
Army Research Laboratory
Adelphi, MD
Aberdeen Proving Ground, MD
White Sands Missile Range, NM
NASA Langley Research Center, Hampton, VA
NASA Lewis Research Center, Cleveland, OH
Chemical & Biological Defense Command
Edgewood RDEC, Aberdeen PG, MD
Tank Automotive and Armament Command
Tank-Automotive RDEC, Warren, MI
Armaments RDEC,
Picatinny Arsenal, NJ
Watervliet Arsenal, NY
Army Research Office
Triangle Park, NC
Washington, DC
Aviation & Missile Command
Aviation RDEC, Missile RDEC,
Redstone Arsenal, AL
NASA Ames, CA
Ft. Eustis, VA
Communications Electronics Command
Communication-Electronics RDEC,
Ft. Monmouth, NJ
Ft. Belvoir, VA
Soldier Systems Command
Natick RDEC, MA
Simulation, Training and Instrumentation Command (STRICOM), Orlando, FL
Combat Casualty Care Directorate
Infectious Disease Directorate
Military Operational Medicine Directorate
Nuclear-Biological-Chemical Defense Directorate

† Army will be the Executive Agent for the Armed Forces Medical R&D Agency

ARMY ACQUISITION STRUCTURE 1986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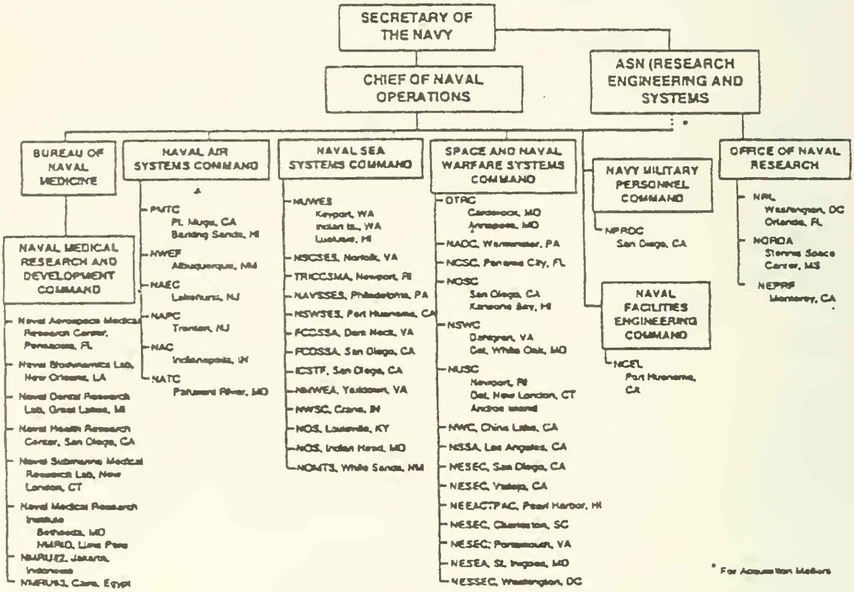
Waterways Experiment Station
Vicksburg, MS
Spring Valley, WI
Calhoun Falls, SC
Louisville, TX
Duck, NC
Army Laboratory Command, Adelphi, MD
Harry Diamond Lab,
Adelphi, MD
Woodbridge, VA
Human Engineering Lab, Aberdeen PG, MD
Ballistic Research Lab, Aberdeen PG, MD
Materials Technology Lab, Watertown, MA
Vulnerability Assessment Lab, WSMR, NM
Atmospheric Sciences Lab, WSMR, NM
Electronics Technology & Devices Lab, Ft. Monmouth, NJ
Armament, Munitions & Chemical Command
Chemical RDEC, Aberdeen PG, MD
Armaments RDEC,
Picatinny Arsenal, NJ
Watervliet Arsenal, NY
Tank Automotive Command
Tank-Automotive RDEC, Warren, MI
Troop Support Command
Natick RDEC, MA
Belvoir RDEC, Ft. Belvoir, VA
Missile Command
Missile RDEC, Redstone Arsenal, AL
Army Research Office
Triangle Park, NC
Washington, DC
Aviation Systems Command
Avionics R&D Activity, Ft. Monmouth, NJ
Aviation Research & Technology Activity, Moffett Field, CA
Directorates:
- Ft. Eustis, VA
- NASA Langley Research Center, Hampton, VA
- NASA Lewis Research Center, Cleveland, OH
Communications Electronics Command
Center for Communication & ADP, Ft. Monmouth, NJ
Center for Night Vision & EO, Ft. Belvoir, VA
Center for Signals Warfare, Vint Hill Farms, VA
Medical Research Institute of Infectious Diseases
Ft. Detrick, MD
Rio de Janeiro, Brazil
Bangkok, Thailand
Nairobi, Kenya
Walter Reed Army Institute of Research, Washington, DC
Institute of Surgical Research, Ft. Sam Houston, TX
Aeromedical Research Lab, Ft. Rucker, AL
Medical Research Institute of Chemical Defense, Aberdeen PG, MD
Research Institute of Environmental Medicine, Natick, MA
Institute of Dental Research, Washington, DC
Biomedical Research & Development Lab, Ft. Detrick, MD
Letterman Army Institute of Research, Presidio, CA

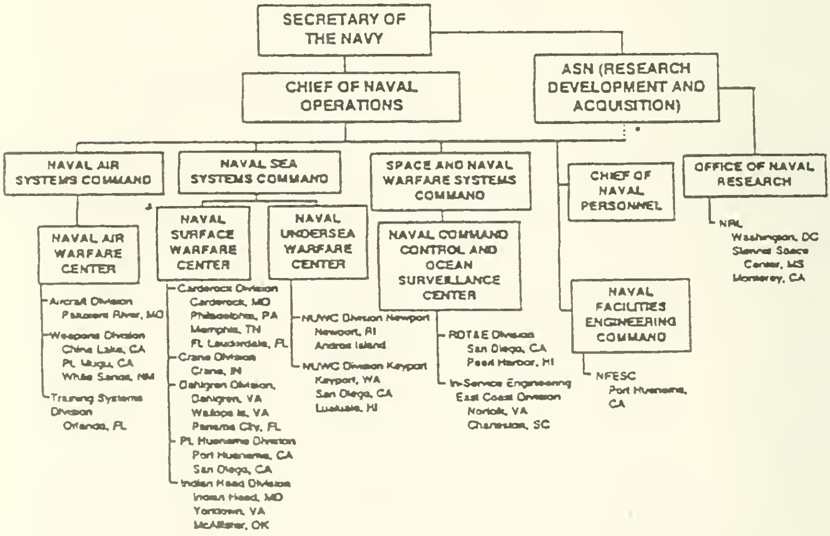
NAVY ACQUISITION STRUCTURE 87-89



* For Acquisition Matters

NAVY ACQUISITION STRUCTURE

AFTER BRAC AND MEDICAL CONSOLIDATIONS



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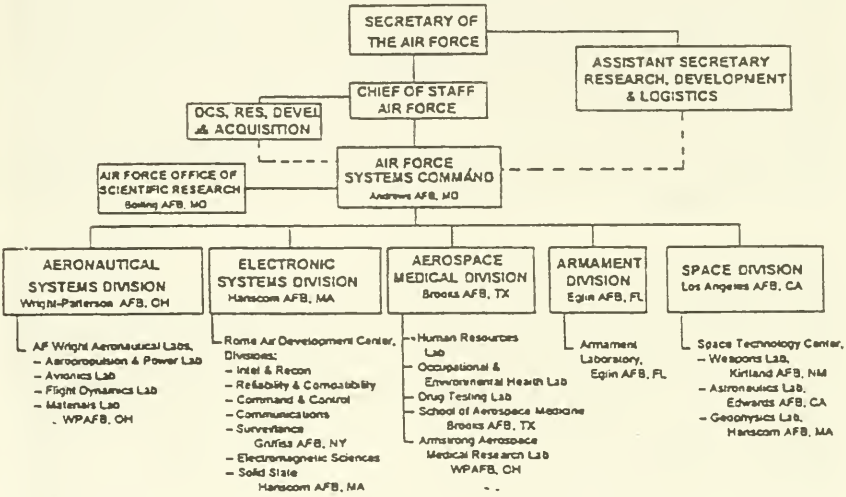
AIR FORCE ACQUISITION STRUCTURE 1986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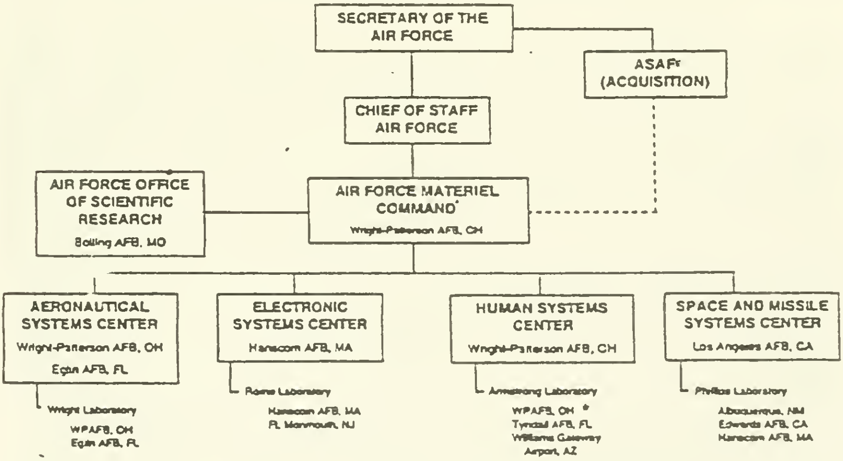
ASSISTANT SECRETARY RESEARCH, DEVELOPMENT & LOGISTICS
CHIEF OF STAFF AIR FORCE
DCS, RES, DEVEL & ACQUISITION
AIR FORCE OFFICE OF SCIENTIFIC RESEARCH Bolling AFB, MD
AIR FORCE SYSTEMS COMMAND Andrews AFB, MD
AERONAUTICAL SYSTEMS DIVISION Wright-Patterson AFB, OH
AF Wright Aeronautical Labs,
– Aeropropulsion & Power Lab
– Avionics Lab
– Flight Dynamics Lab
– Materials Lab
WPAFB, OH
ELECTRONIC SYSTEMS DIVISION Hanscom AFB, MA
Rome Air Development Center, Divisions:
– Intel & Recon
– Reliability & Compatibility
– Command & Control
– Communications
– Surveillance
Griffiss AFB, NY
– Electromagnetic Sciences
– Solid State
Hanscom AFB, MA
AEROSPACE MEDICAL DIVISION Brooks AFB, TX
Human Resources Lab
Occupational & Environmental Health Lab
Drug Testing Lab
School of Aerospace Medicine Brooks AFB, TX
Armstrong Aerospace Medical Research Lab WPAFB, OH
ARMAMENT DIVISION Eglin AFB, FL
Armament Laboratory, Eglin AFB, FL
SPACE DIVISION Los Angeles AFB, CA
Space Technology Center,
– Weapons Lab, Kirtland AFB, NM
– Astronautics Lab, Edwards AFB, CA
– Geophysics Lab, Hanscom AFB, MA

AIR FORCE ACQUISITION STRUCTURE

AFTER BRAC AND MEDICAL CONSOLIDATIONS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AERONAUTICAL SYSTEMS CENTER Wright-Patterson AFB, OH Eglin AFB, FL
Wright Laboratory
WPAFB, OH
Eglin AFB, FL
ELECTRONIC SYSTEMS CENTER Hanscom AFB, MA
Rome Laboratory
Hanscom AFB, MA
Ft. Monmouth, NJ
HUMAN SYSTEMS CENTER Wright-Patterson AFB, OH
Armstrong Laboratory
WPAFB, OH *
Tyndall AFB, FL
Williams Gateway Airport, AZ
SPACE AND MISSILE SYSTEMS CENTER Los Angeles AFB, CA
Phillips Laboratory
Albuquerque, NM
Edwards AFB, CA
Hanscom AFB, MA

* Parts of Armstrong Lab may consolidate into the Armed Forces Medical R&D Agency, but the lab will retain its identity.

LONG TERM BRAC

Senator SMITH. Is there an approach, perhaps like BRAC, which could specifically address the infrastructure issue as a long term issue? What should the scope of such an approach be? Test and evaluation facilities, laboratories or the entire RDT&E infrastructure?

Dr. KAMINSKI. The BRAC process has been effective in reducing the RDT&E infrastructure. Although the BRAC process identifies opportunities for cross-servicing, it is very hard to achieve. In general, the military departments have chosen to reduce the size of their lab infrastructure by force structure (FTE) reductions rather than by BRAC. They found cross-service alternatives more costly or otherwise less supportive of their objectives than in-service ones. As stated by the Secretary of Defense in his February 28, 1995, letter which forwarded his recommendations to the Defense Base Closure and Realignment Commission, "Overall, the cross service effort did assist in reducing capacity and determining where joint or collocated functions made functional or economic sense. Further, this DOD-wide review of support functions provides a road map for cross-servicing in the future."

Part of the difficulty in cross-servicing stems from the importance to the services of roles and missions. The roles and missions assigned to a service are determined by the particular service's ability to perform the function. They are therefore reluctant to eliminate capabilities that are critical for them to be able to perform their assigned roles and missions (e.g., laboratories, test ranges, training facilities, etc.)

TECHNOLOGY BASE

Senator SMITH. Dr. Kaminski, in your statement, you assert that "the fiscal year 1996 amount is the minimum level required to initiate a series of technology "on-ramps" that provide the foundation for meeting tomorrow's joint warfighting needs." Our past experience indicates that often do not reach the increased funding. If the expected increases for Science and Technology programs do not materialize in the outyears and the Defense Department is required to manage at level consistent with the fiscal year 1996 request, what will be the specific impacts on our ability to develop and field the new technologies for the Future Joint Warfighting Capabilities identified by the Joint Staff?

Dr. KAMINSKI. The specific impacts would of course be dependent on the severity of the cuts. Our driving objective is to deter aggression, but should the need for combat arise, victory must be quick, decisive, and with minimal loss of life and equipment. The outyear funding request for the Science and Technology Program is the minimum required to accomplish these objectives. The capabilities you addressed are those the Joint Staff identified as the most needed by U.S. Combatant Commands. There are many other important capabilities that if not vigorously pursued would be added to this list.

DISTRIBUTION OF TECHNOLOGY REINVESTMENT PROJECT FUNDS

Senator SMITH. Dr. Kaminski, as you know, we are trying to put together a hearing next week to focus on the issues surrounding the dual-use technology programs in the Department of Defense. In preparation for that hearing, I would like to ask a couple of questions related to the TRP. First, what is the specific breakout of the programs in the $500 million in the defense reinvestment program for fiscal year 1996? Second, are you planning any changes to the management of the TRP next year if Congress approves the requested amount?

Dr. KAMINSKI. Our approach to the distribution of TRP funding to the statutory programs has always been to maintain maximum flexibility for accommodating the best, new ideas. It is my hope that before assigning fiscal year 1996 funding levels I will have the benefit of seeing the quantity and quality of responses to our fiscal year 1995 solicitation. If these results are similar to the fiscal year 1993 and 1994 competitions, then we would probably seek to put the bulk of fiscal year 1996 funding toward the dual-use technology development activities. These have the most direct, immediate benefit to the military and have been the source of the most ideas in the past.

ARPA is increasing the involvement of the services in the TRP. The Council that advises the ARPA Director now includes the service Senior Acquisition Executives. ARPA has service representatives involved in the process of selecting focus areas and in evaluating incoming proposals, and in the future, plans to increase the service's role in the selection process. ARPA has full-time representatives from each of the services in the TRP office to facilitate a close coordination with the military. The services currently manage a significant portion of the TRP efforts, and ARPA plans to increase this percentage in future efforts.

UNIVERSITIES AND IN-HOUSE LABORATORIES

Senator SMITH. Dr. Kaminski, the Department of Defense is one of several government agencies that funds basic research at universities and in-house laboratories.

How is the relative DOD share of such support determined? How are the broad focus areas of DOD research, as opposed to that of other Federal agencies, assigned in the interagency? How does military relevance play a role?

Dr. KAMINSKI. There are two overriding policies that determine the relative share of research done by in-house laboratories, universities, and industry. First, we attempt to rely on resources outside the Department of Defense (DOD) so as to minimize the Department's research infrastructure and second, we capitalize on the complimentary talents of these research entities so as to maximize the synergy between their efforts. In-house labs sustain critical research and infrastructure that is most effectively done by the government. As a result of these policies, about 58 percent of the $1.2 billion basic research program is performed by over 270 universities. Industry, nonprofit organizations, and FFRDCs conduct another 14 percent, and inhouse laboratories, the remaining 28 percent. In summary, about 72 percent of DOD basic research is outsourced.

The broad focus areas of DOD research are determined by military relevance and the need to be able to apply scientific breakthroughs from many different interlocking fields. Historically, DOD spends its research dollars in the scientific and engineering disciplines that can most significantly impact future warfighting capabilities. The Department dominates Federal investments in several critical fields including computer sciences, electronics, optics, materials, aerospace engineering, and oceanography. For example, significant new competitive awards were announced this year in the areas of Mobile Electric Power, Automated Vision/Sensing Systems, High Energy Microwave Sources, Cryoelectronics, Wireless Communications Networks for the Battlefield, and High Performance Gas Turbine Engines. Major accomplishments in the past year include Nondestructive Diagnostics for Aging Aircraft, Digital Holographic Storage, Stable Ohmic Contacts for Semiconductors, and Improved Reliability for Task Scheduling in Military Computers.

Military relevance is at the core of DOD basic research. All programs are reviewed using two critieria: relevance and merit. Because the mission of DOD research is to improve future warfighting capabilities, we rely on other agencies to perform the science that is not crucial to DOD.

TECHNOLOGY REINVESTMENT PROJECT IN SERVICES

Senator SMITH. If each of the services were given a mandate to establish a dual-use type program in place of the TRP, in what ways would such a program differ from the TRP as it is currently administered? What features of the TRP would you seek to preserve? What projects currently undertaken within the TRP are most relevant to the service missions?

Dr. KAMINSKI. The administration of the current TRP program has evolved through our first two competitions into an effective way of dealing with a broad segment of the industrial base in the United States. I would anticipate that a service dual use program would retain much of what has been learned in the TRP.

The features of TRP that we have found particularly useful are cost-sharing, partnerships and the use of "other transactions." Cost sharing by the industrial performer insures that there is some point and purpose to the work beyond just accepting DOD R&D funding. Partnerships are proving most helpful in insuring the successful transition of technology into applications. ARPA's use of "other transactions" is useful to resolve issues of data rights, and to permit the government to take more of a true partner role with industry.

As I have indicated, our technology development projects all have military relevance. For example, we have a number of efforts in the area of military mobility and deployment, an area in which the services might be interested. The ongoing efforts for battlefield sensors are of particular interest to the Army. All of the services are interested in command, control, communications, computing, and intelligence technologies, and this is one of TRP's largest areas of funding. These are just a few examples of TRP investments that would be of interest to the services.

PROPOSED MASSIVE REDUCTIONS IN S&T PROGRAM IN FISCAL YEAR 1996

Senator SMITH. Mr. Decker, the Army has proposed massive reductions to its S&T program in fiscal year 1996. The 6.2 account is down nearly a third from the appropriated amount for fiscal year 1995, and the 6.3A account has been reduced by nearly one half. What efforts and opportunities are you losing with reductions of this magnitude? When do you propose to make these accounts well?

Mr. DECKER. When compared to the appropriated amount for fiscal year 1995, the fiscal year 1996 proposed Army S&T program appears significantly reduced. The fiscal year 1995 appropriated amount, however, included substantial congressional earmarks ($355 million) for items of special interest which the Army cannot afford to support in fiscal year 1996 and beyond. When compared to the fiscal year 1995 President's budget request, the Army S&T program in fiscal year 1996 does not contain massive reductions and the major reason for decline is the congressionally directed transfer of Medical and Non-Medical Chemical/Biological Defense (CBD) funding from the Army to OSD starting in fiscal year 1996. Much of the remaining decline resulted from OSD-directed RDT&E infrastructure reductions which are in line with the overall DOD drawdown. If additional resources should become available, the Army S&T needs are addressed in the following question.

ARMY PARTICIPATION IN ARPA'S TECHNOLOGY REINVESTMENT PROJECT

Senator SMITH. Mr. Decker, Ms. Slatkin, Mr. Fiester, what is the method by which each of your services has input into the selection of projects and focus areas in the core dual-use program managed by Advanced Research Projects Agency (ARPA)?

Mr. DECKER. In fiscal years 1993 and 1994, the Army provided a senior individual to the TRP staff to develop and execute the six-agency evaluation of the "dual-use" development projects proposed. Additionally, we provided technical reviewers in all technology focus areas.

For the fiscal year 1995 effort, which is currently on hold pending a funding decision by Congress, the Army selected two ARPA technology focus areas (Operations Other Than War, and Digital Wireless Communications and Networking Systems) as critical to our interests; wrote and briefed the technical descriptions of these areas; co-chaired the evaluation panels with ARPA; and provided the bulk of the evaluation team members. Any awards made in these areas would be managed by the Army R&D community.

An Army representative also sits on the working group which reviews various focus area recommendations and develops a coordinated, balanced program across the technology areas. In addition, I now have a seat on the Defense Technology Conversion Council which makes the final recommendations for project awards.

Senator SMITH. In your view, are these core dual-use programs tied sufficiently closely to the mission needs of the services?

Mr. DECKER. No, although we sponsored two fiscal year 1995 TRP focus areas that were of particular interest to us, the Army would like to play a greater role in ARPA's future program planning to ensure more of our mission needs are being addressed. We have already begun to identify focus areas for the fiscal year 1996 TRP. My Deputy Assistant Secretary for Research and Technology, Mr. George Singley, will be the approving authority for all Army TRP focus areas/retirements.

Senator SMITH. Is there a contrast between the level of service involvement in the management of the ARPAs core dual-use program and the TRP?

Mr. DECKER. The Army probably has greater involvement in the TRP than in ARPA's core dual-use program. This is due, in part, to congressional language directing a greater role for the services. For the TRP, we are now actively involved in selecting the technology focus areas and detailing the scope of the projects. The Army does have, however, five military officers working at ARPA in the areas of advanced distributed simulation; command and control warfare; special projects such as operations other than war; defense health care technologies; and software and intelligent systems technology. Army input to ARPA projects in those areas is made through these officers.

MILITARY RELEVANCE OF TECHNOLOGY REINVESTMENT PROJECT

Senator SMITH. What is the process through which the services are involved in the selection of focus areas and projects in the TRP to ensure that the projects have relevance to military requirements?

Mr. DECKER. In the projected fiscal year 1995 competition, the Army selected the two focus areas from ARPA's list that were most important to us. We scoped the efforts, and will co-chair the evaluation panels with ARPA for these areas. For the projected fiscal year 1996 program, we are negotiating with ARPA for the services to nominate their own technology focus areas, thereby ensuring that our most critical mission needs will be reflected in the program. My Deputy Assistant Secretary for Research and Technology, George Singley, will be the approving authority for the Army's TRP focus areas/requirements.

In terms of selecting individual projects to be funded, the Army will be represented on all evaluation panels and on the TRP Working Group, which coordinates project recommendations across the focus areas. Additionally, I will represent the Army on the Defense Technology Conversion Council, which makes final project recommendations to the selecting official, the ARPA Director.

FUNDING SOURCE FOR TECHNOLOGY REINVESTMENT PROJECT

Senator SMITH. Have the service Science and Technology programs been taxed in the DOD budget process to pay for the TRP? Were service Science and Technology programs required to be reduced at the same time as funding for the TRP was increased? If so, to what extent? What are some of the projects the services were required to defer because of the diversion of funds to the TRP?

Mr. DECKER. Although I am unable to make a direct, one-for-one correlation between Army S&T reductions and increases in TRP funding, the Army S&T accounts experienced a net loss of approximately $60 million at the same time Defense Advanced Research Projects Agency funding was increased by $390 million for dual use initiatives.

DUAL-USE PROGRAM REPLACEMENT FOR TECHNOLOGY REINVESTMENT PROJECT

Senator SMITH. If each of the services were given a mandate to establish a dual-use type program in place of the TRP, in what ways would such a program differ from the TRP as it is currently administered? What features of the TRP would you seek to preserve? What projects currently undertaken within the TRP are most relevant to the service missions?

Mr. DECKER. The Army's focus areas would be published annually in an Army section of a tri-service solicitation published by DOD, similar to the SBIR program. Offerors would send their proposals directly to the Army management office. The Army would evaluate the proposals for technical merit, military relevance, dual-use applications (commercial potential), adequacy of effort, contractor qualifications, and cost realism. An integrated order of merit list covering all Army focus areas would be established to determine which efforts would be funded. Funding and management of the program would reside with the Army (services). This situation would ensure mission needs of the services were properly addressed, and would maximize the opportunities to transition successful outcomes into the hands of our soldiers and into the marketplace.

Similar to the TRP, my Deputy Assistant Secretary for Research and Technology would be the approving authority for the Army's focus areas. We would consider continuing the cost sharing aspect of the TRP as a means of leveraging our funds, but must guard against discouraging innovative, small businesses from participating.

Six major TRP funded efforts have directly impacted our military systems requirements; (1) a prototype single module optoelectronic device for multiple wireless communication system requirements complements our efforts to digitize the battlefield and to secure communications; (2) a prototype mobile electric power generation system using nonvolatile fuels could save us 2/3 the weight and volume of present systems; (3) a prototype environmental monitor to remotely identify low concentrations of hazardous chemicals from afar; (4) a field deployable system to detect volatile organic contaminants, polychlorinated biphenyls, heavy metals, and explosives for battlefield monitoring and treaty verification; (5) a ceramic-honeycomb system to separate oxygen from air and deliver it under pressure without pumps for military airborne MEDEVAC and field hospitals; and (6) an infrared sensor based on monolithic microbolometer technology which will greatly reduce the cost of delivered sensors.

RAPID FIELDING OF TECHNOLOGY

Senator SMITH. Mr. Decker, Ms. Slatkin, Mr. Fiester, we have generally considered investments in the services' Science and Technology programs to have potential payoffs in the longer term. All your presentations describe the use of Advanced Concept Technology Demonstrators as a means to make advanced technology available to the field much more quickly. Are there other means that the services are using to make technology available to the field much more quickly? Are these efforts a reflection of the degree to which the CINC's have grown in importance under Goldwater-Nichols? Does the increasing influence of the CINC's present new management challenges trying to balance near-term with long-term initiatives in the service S&T programs?

Mr. DECKER. The Army Science and Technology program sponsors several initiatives which encourage relatively near term technology payoffs. You mentioned ACTDs. In addition we are seeing emergence of fieldable technology from our Advanced Concepts and Technology II (ACT II) Program and from our sponsorship of Battle Lab Warfighting Experiments (BLWEs). We also believe that through the synchronization of certain Army Advanced Technology Demonstrations (ATDs) with Training and Doctrine Command's Advanced Warfighting Experiments as part of Force XXI, some technologies will emerge more rapidly than before. One explanation for this acceleration may be the hands-on interaction of the users with the technology and the greater understanding of the technology in the battlefield context through the various simulation environments used in Advanced Warfighting Experiments (AWEs) and BLWEs.

The most apparent influence of the CINCs in our S&T program is their sponsorship of our ACTDs. As you may be aware, each ACTD must be co-sponsored by a warfighting CINC. As a result, these CINCs and their staffs become intimately involved in all aspects of the ACTDs, particularly in the nature of the leave-behind capability of the ACTD.

To date, we have not experienced any problem balancing near- and far-term initiatives in S&T relative to the CINCs.

TECHNOLOGY BASE PROGRAMS CONGRESS SHOULD STRIVE TO PROTECT

Senator SMITH. Mr. Decker, Ms. Slatkin, Mr. Fiester, as I have stated in my opening statement, the technology base programs may be under great pressure because of the desire to address short-term readiness concerns within a limited budget. I am willing to grant, for the sake of argument, that the administration has carefully weighed the programs in the President's request before sending it to us, but reductions from that request may be forced on us. If that scenario occurs, what are the four or five activities, initiatives or programs that we must strive to protect to the greatest extent? What is your basis for determining these priorities?

Mr. DECKER. The most important activities in the Army technology base program to be protected in the President's budget are as follows:

- Digitization/Information Warfare, Program Element (PE) 0602120A/PE 0602270A/PE 0602782A/PE 0603006A/PE 0603270A/PE 0603772A—Digitizing the battlefield is the application of information technologies to acquire, exchange, and employ timely digital information throughout the battlespace, tailored to the needs of each decider, shooter, and supporter. An objective of Information Warfare is to enable, enhance, and protect the friendly decision cycle while influencing an opponent's cycle throughout the full range of military operations, at all levels of command. It includes command and control, command and control warfare and intelligence integrated within joint combined and interagency operations.
- Advanced Concept Technology Demonstrations (ACTDs)—The Army is lead agency of three OSD-approved ACTDs:
    - Precision/Rapid Counter-Multiple Rocket Launcher (MRL), PE 0603238A—Will demonstrate an adverse weather, day/night, end-to-end, sensor-to-shooter enhanced precision strike capability to defeat the North Korean 240mm MRL threat.
    - Rapid Force Projection Initiative (RFPI), PE 0603313A—Will demonstrate how to improve the capability of early entry forces to defeat a larger armored force in the early phases of a larger deployment (e.g., Operation Desert Shield).
    - Countermine, PE 0602786A/PE 0603606A—Will demonstrate a seamless transition of countermine capabilities from sea to land operations. Demo I (Army lead) will emphasize shallow water, beach and land combat. Demo II (Navy lead) will emphasize clandestine surveillance, reconnaissance and detection from the sea through land assault.
- 21st Century Land Warrior (21 CLW), PE 0603001A/PE 0603313A/PE 0603606A/PE 0603607A/PE 0603710A/PE 0603772A/PE 0602308A/PE 0602705A/PE 0602709A/PE 0602716A/PE 0602786A—A joint Army/USMC program, 21 CLW is the dismounted combatant's digital link to Force XXI, resulting in enhanced survivability, total situational awareness and lethality at the individual and small unit levels. These enhancements will provide the individual combatant with the operational capabilities needed to effectively operate in the full range of military operations, from combat operations to operations other than war.
- Combat Vehicle Integrated Survivability & Mobility, PE 0603005A—Program objective is to maintain key U.S. capability advantages in land systems. A more comprehensive, integrated approach to survivability is needed to counter traditional threats as well as new threats such as autonomous or guided top attack munitions. Mobility advancements are needed to provide advantages in agility that translate into decreased vulnerability and battlefield agility to outmaneuver the enemy.
- Advanced Technology Demonstrations (ATDs)—Army ATDs seek to demonstrate the potential for enhanced military operational capability and/or cost effectiveness. Active participation by the user, as well as the developer, is required throughout the demonstration. This helps the user to develop more informed requirements and the materiel developer to reduce risk prior to the initiation of full-scale system development. The Army has 29 approved ATDs.

- Advanced Concepts and Technology II (ACT II), PE 0602308A—Program provides critical funding and a timely, low overhead mechanism for the TRADOC Battle Labs and the Louisiana Maneuvers Task Force to solve warfighting problems through the evaluation of mature technologies, prototypes, interfaces, software, and/or systems provided by industry and academia.
- Research, PE 0601101A/PE 0601102A/PE 0601104A—Supports the federated laboratory initiative, centers of excellence, and in-house research in Army unique areas. The program creates a new paradigm for Army research by focusing in-house expertise on Army specific business areas and establishing extramural centers of research in areas where state-of-the-art expertise can be leveraged to satisfy Army technology needs.

The basis for determining these priorities is the Army's force modernization strategy which is based on the Army leadership's vision of the future Army, Force XXI, as constrained by realistic, funding limits.

TECHNOLOGY BASE AREAS OF GREATEST ADDITIONAL NEED

Senator SMITH. Mr. Decker, Ms. Slatkin, Mr. Fiester, by the same token, if we are able to free up more resources for the technology base, where are the areas of greatest additional need or potential payoff?

Mr. DECKER. The areas of greatest additional need or potential payoff in the Army technology base are the following programs:

- +$5 million in Program Element (PE) 0603313A for (1) acceleration of the guided rocket for the Multiple Launch Rocket System (MLRS) to coincide with fielding of the extended range MLRS, and (2) evaluation of the Low Cost Anti-Armor Submunition (LOCAAS) seeker in captive flight testing.
- +$1 million in PE 0603313A to conduct captive flight testing of a prototype 2.75 inch diameter imaging infrared seeker which is compatible with Stinger RMP missile airframe. The captive flight testing will be conducted to evaluate the seeker performance in the presence of active IR countermeasures such as flares.
- +$4.2 million in PE 0602618A to support continuation of the Focused Technology Program (FTP). This program enhancement will accelerate the follow-on FTP contract to mature electric armament technology for a future main battle tank and will focus on system and power management issues, evaluating prime power sources to meet armament and mobility demands.
- +$6 million in PE 0603004A to (1) accelerate the Precision Guided Mortar Munition (PGMM) demonstration program. It is understood that it may be possible to increase by a factor of two the effective range of 120 millimeter (mm) mortars, and guidance and control technologies have the potential to dramatically increase the effectiveness of fielded mortar systems especially for light forces opposed by heavier forces, and (2) mature guidance and control technology for 155mm artillery fuzes. The Global Positioning System (GPS) and other miniaturized components can be incorporated into artillery fuzes, thereby enhancing accuracy at all ranges and dramatically improving ammunition logistics.
- +$5 million in PE 0602308A for the Advanced Concepts and Technology (ACT) II program to support evaluation by TRADOC Battle Laboratories and Force XXI Advanced Warfighter Experiments of mature technologies for Force XXI.
- +$4 million in PE 0603005A for ground vehicle technologies, such as integrated survivability and controls, displays, and software associated with advanced combat vehicle crew stations. Continued modernization of land forces is essential to maintain U.S. superiority and minimize casualties in any future conflict, and a robust land vehicle S&T program is essential to provide the technological options to feed that modernization.

SMALL BUSINESS INNOVATION RESEARCH PROGRAM INTEGRATION

Senator SMITH. Mr. Decker, Ms. Slatkin, Mr. Fiester, the Small Business Innovative Research (SBIR) program is a tax on your Research and Development (R&D) accounts to ensure a role for small business in providing R&D to the Department of Defense (DOD). The percentage available for the program is now 25 percent of R&D funding. Have you succeeded in integrating the SBIR program into your general Science and Technology (S&T) program? If so, how, given the criticism concerning the utility of the program for DOD over the last several years?

Mr. DECKER. The SBIR assessment, currently 20 percent of our extramural R&D accounts, will increase to 25 percent in fiscal year 1997. The Army recognizes that a large percentage of industry's innovative ideas originate in the small business community. We have taken a number of steps to integrate the SBIR program into our S&T program. Army SBIR topics originate in our laboratories and Research, Development and Engineering Centers, which are the backbone of the Army S&T program. Personnel from these organizations conduct the technical evaluations on all SBIR proposals submitted to the Army. The General Officer Steering Committee that approves Army SBIR projects to be funded is composed of members from the Army major commands involved in R&D.

The Army recently focused its SBIR proposal solicitation, evaluation and selection process to specifically address technology areas identified in the Army S&T master plan and the Defense Technology Plan. We have instituted strong measures to eliminate funding of redundant projects, reduce the funding gap between Phase I and Phase II projects, and improve the commercialization of project deliverables. In summary, the SBIR program is a critical and integral part of the Army S&T program.

RDT&E MANAGEMENT AND SUPPORT

Senator SMITH. Mr. Decker, while the Army has substantially reduced its proposed activities in Science and Technology, the amount requested for RDT&E management support has declined little from the amount appropriated for the current fiscal year. The Army has half the RDT&E budget of the Navy and twice the amount for infrastructure support. How does the Army justify preserving its infrastructure account at this year's level while making such dramatic reductions in the program accounts supported by the infrastructure? Is this comparison a fair one? What are the Army's long-term plans for reducing its infrastructure? What targets are you trying to reach?

Mr. DECKER. When compared to the previous request and normalized for the Chemical, Biological Defense transfer to OSD, the actual decline in S&T from fiscal year 1995 to fiscal year 1996 was about 5 percent which resulted partially from 6.2 funded infrastructure reductions. The comparison of fiscal year 1995 to fiscal year 1996 requests for Management Support (budget activity six) costs shows little decline because these accounts have taken substantial reductions in recent prior years. The Army's budget activity six has in fact been reduced 22 percent since fiscal year 1992 and is scheduled to further decline by another 10 percent ($126 million) between fiscal year 1996 and fiscal year 1997. These reductions are a direct result of RDT&E infrastructure reductions and consolidations; and planned support for a declining Research, Development, Acquisition (RDA) business base.

A comparison between Army and Navy management support accounts does not present a fair or accurate comparison since each service programs and budgets for it's budget activity six costs differently. These differences as well as other service unique costs account for the disparity between the Army and Navy funding for management support. For example, the Army's fiscal year 1996 request includes $426 million for RDT&E Base Operations and Maintenance and Repair. The Navy funds these costs under Defense Business Operating Fund (DBOF). The Army request includes $150 million to fund Kwajalein, a unique Army requirement to support testing of defensive missiles. The Army's request includes $79 million for Environmental Compliance and Pollution Prevention while the Navy funds these costs mainly out of their Operation and Maintenance (Non-RDA) accounts. A comparison between the Army and Air Force would yield similar results, since the Air Force also funds considerable portions of their management costs in O&M and other RDT&E accounts.

The Army's long-term plan to reduce infrastructure consists of completing already approved Base Realignments and Closures, BRAC–95, and a steady drawdown of personnel.

The previous BRACs will result in the closing of four installations, the elimination of nine activities and functions, the movements of 27 activities and functions to 18 installations, and elimination of 1,679 civilian positions.

The Army has recommended to the BRAC–95 Commission the disestablishment and closure of the Aviation-Troop Command by relocating its missions and functions to the Missile Command, Soldier Systems Command, Communications-Electronics Command, and Tank-Automotive and Armaments Command. The Army has also recommended the realignment of several activities from the Dugway Proving Ground to the Aberdeen and Yuma Proving Grounds. These actions if approved will result in the estimated elimination of 1,351 civilian positions.

Our overall goal for civilian RDT&E drawdown is a 30 percent personnel reduction by the end of fiscal year 1999 in comparison to the beginning of the decade. These base closures and personnel reductions will allow the Army to maintain a robust extramural RDT&E program and meet our mission requirements.

ACQUISITION REFORM AT ARMY LEVEL

Senator SMITH. Mr. Decker, in a few weeks we are planning a hearing to examine the implications of the so-called Revolution in Military Affairs on the investment decisions we must make in fiscal year 1996. The Army approach to the revolution in military affairs is to build Force XXI. Describe Force XXI in more detail and explain how the Army intends to step toward that concept within the RDT&E program in the fiscal year 1996 request? If your RDT&E budget remains at 7 percent of the Army total when will you have affordable technologies for a viable Force XXI?

Mr. DECKER. First you have to remember that Force XXI is a vision for the total force and that it is not tied to any one piece of equipment. Force XXI is America's Army for the 21st century, transformed in its entirety. It will be a knowledge and capabilities-based, power projection Army, capable of land force dominance across the continuum of 21st century military operations. Force XXI is a process of continuous transformation to achieve a "better" Army capable of responding to the challenges of the world's ever changing geopolitical environment. It will be derived from a series of Advanced Warfighting Experiments (AWE), Advanced Technology Demonstrations (ATD), and Advanced Concept Technology Demonstrations (ACTD) which will provide insights into required changes in organization, equipment, training, and doctrine. The goal of the Force XXI Campaign Plan is to make all key fielding and support decisions by the year 2000, enabling an initial Army-wide Force XXI capability by the year 2010.

We will accomplish this goal by leveraging the power of Information Age technology and linking it to the Army's quality people. Force XXI will apply the power of digitization to the Army's five modernization objectives (project and sustain, protect the force, win the information war, precision strike, and dominate maneuver) to achieve significant enhancements in lethality, survivability, operating tempo, deployability, versatility, sustainability, and joint/combined connectivity. The process of achieving Force XXI will involve an interactive and linked series of AWEs, ATDs, and ACTDs which will provide insights into the critical decisions the Army must make in the areas of future organizations, equipment, training, and doctrine.

The Army is in a resource-constrained environment. Therefore, we must focus Research, Development, and Acquisition dollars to achieve Force XXI capabilities while maintaining core programs. The Army cannot afford to modernize in one area only.

For example, if we improve the capability to dominate the maneuver battle by upgrading a tank engine to increase operational tempo, but fail to improve the engine of our self-propelled artillery to conduct precision strike we are unable to synchronize our maneuver with fires and we lose the value added gained when these systems work together. If we modernize our information systems to win the information war but do not have enough strategic lift or modern trucks to project and sustain the force, then all the advantages of high tech weapons do not contribute to decisive victory. Therefore, synchronization of systems which support the modernization objectives either by providing Force XXI capabilities or supporting essential core functions is the key to maintaining a balanced approach and efficiently utilizing the scarce RDT&E dollars we have.

Modernization and long term RDT&E shortfalls are of particular concern in this budget. We have attempted to reduce the impact of decreased funding by emphasizing product improvements of existing systems as a way to achieve the greatest payoff for scarce resources and to leverage technology to the degree we can in the budget request. It is clearly recognized by the Army leadership that we cannot continue to underfund modernization without having a negative impact on the battlefield capabilities of our future Army. Within the budget constraints the Army is funding Force XXI technologies to the best of its capabilities, but the leadership has clearly stated that if additional funding becomes available some of that money designated for modernization accounts would go toward speeding up the development of Force XXI technologies.

USE OF NEW AUTHORITY TO STREAMLINE ACQUISITION SYSTEMS

Senator SMITH. Mr. Decker, Ms. Slatkin, Mr. Fiester, last year the Navy made a valiant attempt to start its own Technology Reinvestment Project (TRP) program similar to the program that Advanced Research Projects Agency (ARPA) conducts. While we fully funded the program the appropriations committee did not. We were able to change the law, however, to give all of you the authority to use TRP procedures, other instruments authority, cost-sharing for partnerships, and so forth. My impression, however, is that you have done little to plan for the use of this authority. Are you planning to use this new authority to streamline your acquisition systems?

Last year we also passed legislation to give you a bigger role in shaping the so called "focus areas" of the ARPA TRP program. Have you used this larger role to shape the program? Are you comfortable with your influence over the TRP program goals?

Mr. DECKER. The Army Secretariat will be working closely to ensure that the new authority is implemented as part of our overall procurement streamlining effort.

The recent legislation gave the services direct input into the selection of technology focus areas, ensuring that our most critical mission needs will be addressed. The legislation also made the Service Acquisition Executives members of the Defense Technology Conversion Council. Currently, the Army co-chairs two technology focus areas with ARPA and evaluates proposals against those areas. These are all steps in the right direction. I would like to see even greater service participation in and control over the TRP. This would certainly ensure the military relevance aspect of dual-use. This could be accomplished by allowing the services to publish their own technology focus areas in sections of a tri-service solicitation published by DOD. The evaluation and selection process would be similar to that of the Small Business Innovation Research program. Funding and management of the program would likewise reside with the services. This would enable the services to adequately address critical mission needs and to maximize opportunities to transition successful outcomes into the hands of our warfighters and/or into the marketplace.

Senator SMITH. Mr. Decker, Ms. Slatkin, Mr. Fiester, what is the method by which each of your services has input into the selection of projects and focus areas in the core dual-use program managed by ARPA.

Ms. SLATKIN. No formal method exists by which the Navy has input into the selection of projects and focus areas in ARPA's core dual-use programs. However, there is an informal method by which the service S&T communities are involved. ARPA program managers recruit service S&T personnel (agents) that are working and/or knowledgeable in the field of proposed development. Agents that have accepted a request to support ARPA in one of their technology development competitions provide technical input for construction of the focus area, and evaluate proposals received during the competition. In most instances, service members of the team go on to manage the project for the ARPA program manager. In general, programmatic decisions are made by the agent but may require a joint decision that includes the ARPA program manager.

Senator SMITH. In your view, are these core dual-use programs tied sufficiently closely to the mission needs of the services?

Ms. SLATKIN. Yes, ARPA's core dual-use programs are tied sufficiently close to the mission-needs of the services. ARPA's dual-use programs supplement service programs by focusing significant dollars in short term efforts to exploit potentially high payoff opportunities with both service and commercial significance.

Senator SMITH. Is there a contrast between the level of service involvement in the management of the ARPA's core dual-use program and the TRP?

Ms. SLATKIN. Yes, there is a contrast between the level of service involvement in the management of the ARPA's core dual-use program and the TRP. This stems from the formal member status given to the other five agencies involved in the TRP.

Senator SMITH. What is the process through which the services are involved in the selection of focus areas and projects in the TRP to ensure that the projects have relevance to military requirements?

Ms. SLATKIN. The services begin the process by providing ARPA with an initial list of topic suggestions. The topics are then collated with those of the other services, and we look at the complete list to identify naval focus areas. Two co-chairs, one from ARPA and one from the interested service, are assigned to ARPA for each naval focus area, and naval representatives are assigned to the remaining focus areas. Additionally, we assign a full-time member to the TRP working group and a deputy director to the MARITECH Program.

Senator SMITH. Have the service Science and Technology programs been taxed in the DOD budget process to pay for the TRP? Were service Science and Technology programs required to be reduced at the same time as funding for the TRP was increased? If so, to what extent? What are some of the projects the services were required to defer because of the diversion of funds to the TRP?

Ms. SLATKIN. When the Department of Defense established the Technology Reinvestment Program (TRP) within ARPA in fiscal year 1994, TRP and other non-Navy funding rose by more than $662 million. The Navy 6.2 program budget experienced reductions of $54 million, along with programs focused on Undersea Superiority Technology and Advanced Technology Demonstrations that were reduced by $68 million. The total $122 million reduction in naval science and technology funding was never identified with specific increases to any particular plus up.

Projects deferred or eliminated as a result of reductions in naval science and technology funding include the following:

- The Navy Independent Exploratory Development program was eliminated. This program encouraged laboratory technical directors to pursue technology efforts in high payoff/high risk areas.

- Support for low-cost alternative concepts for ship self-defense of noncombatants was eliminated.
- The Navy's contribution to ARPA's effort for developing control logic in 14/WIZARD was eliminated.
- Efforts to develop technology that would aid the detection and classification of subsurface contacts in littoral environments were delayed.
- Efforts to develop submarine laser communications technologies were delayed.
- Development of unmanned underwater vehicles, semi-autonomous undersea vehicles, and undersea vehicle propulsion systems were delayed. The underwater vehicles mentioned and related systems are integral to the further development of anti-submarine warfighting capabilities and the improvement of shallow water mine reconnaissance and neutralization.
- In the area of Advanced Technology Demonstrations (ATD's), the realization of a low-cost and quiet method of torpedo ejection for the New Attack Submarine was delayed. Additional delays due to reduced funding were encountered in the Advanced Lightweight Fuselage, Advanced IR Sensor, and Auditory Interface for Tactical Acoustic Processing programs. Each of the delayed ATD programs focused on providing sailors and marines with superior tactical situation awareness, speed, and stealth-related capabilities.

In addition, the Navy was directed to reprogram $24.2 million from S&T to ARPA for TRP. Congress, in their review of the reprogramming action, subsequently changed the figure to $19.2 million. This resulted in a $13 million reduction to the 6.2 account which was already at an all time low.

It should be noted that one-time reductions such as those described above have an impact beyond the year of the actual reduction. A new baseline is established which is then used to reset patterns of real growth.

Senator SMITH. If each of the services were given a mandate to establish a dual-use type program in place of the TRP, in what ways would such a program differ from the TRP as it is currently administered? What features of the TRP would you seek to preserve? What projects currently undertaken with the TRP are most relevant to the service missions?

Ms. SLATKIN. The Technology Research Program is focused on commercialization of mature technologies. The Department of the Navy program would focus its programs on emerging science and technologies. We would involve industry as early as possible in program development to allow commercial development to coincide with military application.

The current TRP projects that are most naval relevant include:

- Fly-By-Light Advanced Systems Hardware
- Program Autonomous Landing Guidance
- Power Pack Mobile Electric Power System
- Electric Powertrain Commercial Shipbuilding Focused Development Project
- Portable Shipbuilding Robotics Center for Advanced Ship Repair and Maintenance
- Development of the Submerged Electric Drive Cargo Pumping System
- Advanced Power Conversion Based On the Aerocapacitor
- LEGOS Program
- Object-based Software Components for Mission-Critical Systems
- ULTRA Program
- Advanced "Zero Emissions" Control Valve Development
- Power Electronic Building Blocks for Affordable High Performance of Electric Power
- Analog Optoelectronic Module Development
- Just-In-Time Maintenance

Senator SMITH. Mr. Decker, Ms. Slatkin, Mr. Fiester, we have generally considered investments in the services' Science and Technology programs to have potential payoffs in the longer term. All your presentations describe the use of Advanced Concept Technology Demonstrators as a means to make advanced technology available to the field much more quickly. Are there other means that the services are using to make technology available to the field much more quickly? Are these efforts a reflection of the degree to which the CINC's have grown in importance under Goldwater-Nicholas? Does the increasing influence of the CINC's present new management challenges trying to balance near-term with long-term initiatives in the service S&T programs?

Ms. SLATKIN. Efforts to accelerate the transition of new systems and concepts to fleet applications are important because they enhance the ultimate payoff from our investment in science and technology and because they are essential to sustain our technological edge over potential adversaries in an era of rapidly moving technology. By greatly reducing all dimensions of risk associated with the application of new technology, the Advanced Concept Technology Demonstrations are a very powerful transition tool.

We continue to explore ways to accelerate transition at all levels of the science and technology spectrum. For example, over the last several years the Navy has achieved a significant increase in the direct participation of industry in our Advanced Technology Development programs. As a result, successful new concepts are more immediately available to the companies who actually insert new technology into naval systems. It is also important to recognize that many ideas flow directly to fleet application from our basic research and exploratory development programs without the need for advanced technology development. This is true, for example, in the case of data and models that increase our ability to forecast tactically important conditions in the marine environment. Efforts in recent years to strengthen communications between researchers and warfighters has greatly increased the potential for the rapid flow of new ideas in both directions.

To insure that the fleet is aware of innovations that could be delivered quickly to meet special requirements, the Office of Naval Research has recently developed a "blue book", a catalog of maturing capabilities, dividends from prior long term investments, that could quickly be delivered to the fleet in small numbers to demonstrate their utility. The "blue book" is revised semiannually by Naval Science Assistance Program personnel, who are stationed worldwide at the various CINC and Fleet Headquarters sites.

History has demonstrated that highly productive science and technology programs result from a healthy tension between the pull of requirements and a creative vision for long term possibilities. We believe that recent efforts to strengthen communications between researchers and warfighters has had a beneficial impact on our programs.

Senator SMITH. Mr. Decker, Ms. Slatkin, Mr. Fiester, as I have stated in my opening statement, the technology base programs may be under great pressure because of the desire to address short-term readiness concerns within a limited budget. I am willing to grant, for the sake of argument, that the administration has carefully weighed the programs in the President's request before sending it to us, but reductions from that request may be forced on us. If that scenario occurs, what are the four or five activities, initiatives or programs that we must strive to protect to the greatest extent? What is your basis for determining these priorities?

Ms. SLATKIN. The Navy science and technology programs presented in the President's budget request have been thoroughly reviewed and weighed at many levels in the process of budget preparation. We believe that they represent a solid and important work list for Navy S&T. The following areas are of critical importance to this portion of the Department of the Navy's budget request:

- **Basic research**

We must maintain a strong commitment to basic research to exploit the ongoing scientific revolution, and ensure the fleet receives future technologies that are more capable than any potential adversary.

Basic research is our most highly leveraged investment. Commitment to basic research keeps the Navy involved at the forefront of the scientific march and gives early visibility to discoveries and innovations that lead to technological advantage.

- **Navy unique and essential programs**

The Navy's ocean operating environment demands unique S&T related directly to it.

Our *ocean sciences* program is critically important to develop expanded information on near-shore and surf zone dynamics, small scale physical oceanography, the ocean surface interfaces, ocean optics and many other specialized niches. Ocean geophysics and ocean optics for example, provide specialized knowledge that is invaluable in the difficult task of clearing mines in shallow, turbulent water. As another example, atmospheric sciences provide tactically significant information on weather conditions (at high resolution) near shore and on target as well as other areas of interest like the generation and behavior of violent, costly tropical cyclones.

Advanced materials for naval applications must be affordable, strong, lightweight and resistant to corrosion beyond commercial or other service requirements.

Advanced, specialized *remote sensors*, platforms, signal processing and software for reduction of data to information must be developed for monitoring movements, traffic and naval operations in ocean areas.

Advanced propulsion and energy sources must be developed to extend the speed, range and performance of weapons and naval platforms, reduce cost of operations and reduce dependence on foreign supplies.

Personnel optimization/training are pivotal to a future of reduced operating time at sea. We must master the integrated techniques of realistic training at high levels of effectiveness without associated operational costs.

Each of these Navy unique and essential S&T areas is important when executing naval operations in open ocean as well as littoral zones.

- **Future fleet capabilities and technology opportunities**

The fleet has identifiable warfighting capabilities that it will need in the future. Simultaneously, scientific endeavors and technology developments continue to offer opportunities to mitigate or resolve current and near-term fleet problems. The following are critical areas in these realms of S&T that must continue:

Over the horizon surveillance and engagement—Monitoring and controlling ocean areas beyond the horizon enhances fleet self defense and shelters allied/coalition units and land areas.

Ability to strike time critical targets—Essential to counter existing weapons and to control future low intensity conflict situations.

Ability to conduct assured littoral operations—Among the many essential S&T efforts are: (1) finding modern diesel-electric submarines in shallow water, (2) neutralizing mines and obstacles from the deep ocean inland to the objective, (3) swift movement of troops from secure ships far offshore to the assault location, and (4) versatile, intelligent movement of material in concert with amphibious forces.

Battlespace information dominance—This capability is aimed at eliminating the fog of war for joint forces and maximizing the fog of war for the adversary. Information dominance ensures that our forces possess the most accurate, timely information, and the ability to communicate reliably among themselves, while simultaneously denying the adversary comparable capabilities.

- **S&T for affordability and availability of unique systems and equipment**

Budget reductions will continually force choices about procurement and long-term production continuity. S&T must address the problems of reduced supplier bases for unique products, continuing efforts to reduce cost through replacements of unique, expensive assemblies or materials, and assessing technology developments for low cost opportunities to extend service life or increase performance.

Senator SMITH. Mr. Decker, Ms. Slatkin, Mr. Fiester, by the same token, if we are able to free up more resources for the technology base, where are the areas of greatest additional need or potential payoff?

Ms. SLATKIN. If provided additional resources for the technology base, the Navy would consider investment in the following areas: oceanographic remote sensing; avionic systems technology; surface fire support improvements; unmanned air vehicle technology; logistics over the shore technology; lightweight wideband surveillance systems; "smart" undersea weapons technology; high assurance computing technology; and a Navy pilot program for the joint development of new military/commercial technologies.

If additional Advanced Technology Development funds were available, the Navy would support proposals in the following areas: Concentric Multifunction Canister Launcher; Concurrently Engineered Ball-Joint Gimbal for Joint Strike Weapons; Precision Strike Navigator; Autonomous Bottom Crawler Fleet for mine detection and neutralization; Wide Band Waveform Discrimination/Classification; Power Modulation; Surgical Strike/C^3 Adaptive Video and Data Communications System; Advanced Digital Magnetic Anomaly Detection Device; and Solid State Visible/Long Wavelength Infrared Color Night Vision.

Senator SMITH. Mr. Decker, Ms. Slatkin, Mr. Fiester, the Small Business Innovative Research program is a tax on your R&D accounts to ensure a role for small business in providing R&D to the Department of Defense. The percentage available for the program is now 2.5 percent of R&D funding. Have you succeeded in integrating the SBIR program into your general S&T program? If so, how, given the criticism concerning the utility of the program for DOD over the last several years?

Ms. SLATKIN. The SBIR funding is at 2.0 percent of the extramural RDT&E budget (i.e., those funds not used for in-house support) in fiscal years 1995/96 and rises to 2.5 percent in fiscal year 1997 and beyond by statute. The Navy has integrated the SBIR program by requiring it to be responsive to the overall needs and requirements of the Navy. This is accomplished by generating topics for the SBIR solicitation (that is published semiannually) for small businesses to submit their solicitations. This follows the same process that the overall S&T and other RDT&E programs follow. In fact, the major commands which participate in the program factor the anticipated outcome of the SBIR technology into the planning stages of their programs. The following is an example of how an SBIR program is providing a solution to the DOD in resolving the problem of "Total Asset Visibility". Approximately

$40,000.000 of equipment was lost in Desert Storm due to the inability to locate and identify what equipment was shipped in a timely fashion. If there was a technology available that could identify equipment within a container(s) without physically searching the container much of this loss could have been avoided. In short, some items were reordered and thus duplicated, while other equipment did not arrive on time. SAVI Technology, Inc., a small Mountain View, CA company responded to a Navy SBIR topic in the fiscal year 1989 solicitation and developed a RF technology system that is capable of locating RF tagged equipment within 200 yards of the RF interrogator. In fiscal year 1994, DOD subsequently contracted with SAVI to provide the RF equipment on an as needed basis. This technology has been used in Bosnia, Somalia, and Haiti. It has also been used to continually track retrograde munitions shipped from Germany to the United States using GPS and is presently being tested at a Navy rework facility to track various components during refurbishment to ensure that all components are available for final assembly on schedule.

Senator SMITH. (All witnesses), in the Federal Acquisition Streamlining Act of 1994, 10 U.S.C. 2371 was modified to give the services greater flexibility in the use of contracting authority outside the Federal Acquisition Regulations. What plans do the services have to use this authority in the future in areas like dual-use technology development with cost sharing?

Ms. SLATKIN. The Department of the Navy is planning to use this authority as a mechanism for execution of the DDR&E Federal Defense Laboratory Diversification Program in fiscal year 1995. Due to its cooperative nature, this program will foster use of business/commercial practices at the Defense laboratories during its execution. The program is based on a principal of cost sharing and in-kind contributions by the private partner. Twenty percent of program funds are designated for the Laboratory partner and 80 percent for the private partner, with management of the funds by the laboratory partner.

Navy also plans to use the Cooperative Agreement mechanism in two pilot projects at the Office of Naval Research: the Power Electronic Building Blocks program and the Indium Phosphide Solar Cells program.

Senator SMITH. Ms. Slatkin, the Navy has the lowest amounts in the budget request of any of the services for 6.2 and 6.3 programs even though the total for RDT&E funding compares favorably with the amounts requested by the other services. What factors drove the funding decisions for the 6.2 and 6.3 accounts?

How will this funding approach affect the Navy's ability to transition technology from the laboratory to the warfighter?

Is this indicative of the longer term Navy approach to funding Science and Technology Programs?

Ms. SLATKIN. Our approach has been to increase our 6.2 and 6.3 investment, while protecting basic research by maintaining 6.1 at a constant funding level. While this has, and will, vary a bit on a year-to-year basis, we think this is the right balance of S&T investment and plan to continue this approach in allocating our S&T funds. All Naval S&T is integrated in one organization where programs are managed to achieve the best balance across disciplines and technologies.

In the Navy, we regard the 6.1 Basic Research effort as one of our most highly leveraged and productive investments. In 6.1, almost 30 percent of our program is for unique ocean sciences work and the study of phenomena unique to the marine environment. The commitment to our superb corporate laboratory, the Naval Research Laboratory, also impacts this portion of the budget. The pace of scientific endeavor and technological change continues to increase and the Navy and Marine Corps must remain abreast of fundamental scientific and technical developments if we are to maintain the technological superiority of our future forces. We allocate a significant portion of our R&D dollars to Basic Research to make sure that we do not become the victim of technological surprise and that promising developments are brought rapidly to the attention of our acquisition and warfighting communities. Selection of programs by experienced science officers ensures that Navy remains on the cutting edge of science and technology and addresses problems of relevance to our forces. By investing across a broad spectrum of Navy relevant science and technology areas, we ensure our readiness to meet the needs of a somewhat uncertain future.

There is also an important secondary benefit. Our university research program provides the country with a core of scientists and investigators familiar with Navy and Marine Corps programs and who are interested in pursuing science and technology developments of interest to the Department of the Navy. The program also serves as a training ground for many scientists and engineers that find eventual employment in non-defense sectors of the economy . . . helping to enhance our economic competitiveness and keep our country at the forefront of technological development.

Exploratory Development (6.2) builds on the results of our Basic Research effort. We invest in fewer projects, but ones which are viewed as having a high payoff . . . either in meeting the expressed needs of the warfighting community or in providing a significant new or increased capability for our future forces. The most promising Basic Research developments are explored in more depth to determine their applicability to particular Navy needs and requirements as well as their feasibility . . . at least on a laboratory scale. A similar process occurs as projects are moved from Exploratory to Advanced Development. Only the most promising and most needed work is moved forward to the full scale demonstration. Demonstration is the last step in the R&D process where significant risk can be taken at relatively low cost, before proceeding on to higher, more expensive stages in the acquisition process. This process . . . pursuing a large range of projects in 6.1 . . . carrying fewer, carefully selected ones into 6.2 exploration and moving only the most promising and needed ones on to 6.3 demonstration . . . allows us to have the type of investment allocation across the S&T accounts that we have requested. We spend fewer dollars per project in 6.1, somewhat more in 6.2 and a great deal more . . . as compared with a typical 6.1 project . . . in 6.3. This process enhances our ability to transition needed improvements to our Fleet and Marine forces while, at the same time, ensuring that we are adequately prepared to meet the challenges of the future.

Senator SMITH. Ms. Slatkin, there has been a significant increase in the amount of funding for programs in the 6.3 account that have traditionally been funded elsewhere in the budget. This includes programs such as MANTECH. Has the incorporation of these programs into the 6.3 line caused changes to the manner in which the Navy Advanced Technology program is managed?

Ms. SLATKIN. There have been no changes the management of the Navy Advanced Technology program. However, it must be noted that program additions give a false impression of the size of the Navy 6.3 account. The amount of funds available to demonstrate and transition Naval science and technology products is significantly less than would appear from looking at the total resources available for 6.3 programs. For example, in fiscal year 1995 funding for Bone Marrow work, MANTECH, and intercooled regenerative engine consumed approximately 30 percent of the Department of the Navy 6.3 program.

Senator SMITH. In your view, are these core dual-use programs tied sufficiently close to the mission needs of the services?

Mr. FIESTER. Yes, from an Air Force perspective, the core dual-use programs that we are associated with are relevant to our mission needs.

Senator SMITH. Is there a contrast between the level of service involvement in the management of the ARPA's core dual-use program and the TRP?

Mr. FIESTER. Yes. However, the contrast between the management of ARPA's core dual-use program and the TRP is not significant. Both the core dual-use program and the TRP are basically similarly managed by CPA with Air Force input.

Senator SMITH. What is the process through which the services are involved in the selection of focus areas and projects in the TRP to ensure that the projects have relevance to military requirements?

Mr. FIESTER. We work very closely with in the selection of focus areas and projects in the TRP. Participating Air Force personnel have been instructed to ensure that the projects they are involved with have military relevance. The present plan for the fiscal year 1996 competition involves the services and ARPA in the writing of all focus area descriptions to help ensure military relevance. As stated before, Air Force personnel then help evaluate the proposals and frequently manage the program.

Senator SMITH. Have the Services' Science and Technology Programs been taxed in the DOD budget process to pay for the TRP? Were the services' Science and Technology Programs required to be reduced at the same time as funding for the TRP was increased? If so, to what extent? What are some of the projects the services were required to defer because of the diversion of funds to TRP?

Mr. FIESTER. Yes. The Air Force Science and Technology (S&T) Program was taxed in fiscal year 1995 for the TRP. Yes. The Air Force S&T Program was reduced as funding for the TRP was increased. The Air Force S&T Program was reduced by $35 million in fiscal year 1995 to fund TRP. The $35 million was assessed to general reductions in budget activities 1, 2, and 3. Additionally, Global Surveillance and Precision Strike was identified as a specific source.

Senator SMITH. If each of the services were given a mandate to establish a dual-use type program in place of TRP, in what ways would such a program differ from the TRP as it is currently administered? What features of the TRP would you seek to preserve?

Mr. FIESTER. If the Air Force was given a mandate to establish a dual-use type program, I do not believe we would make any significant changes to the way the

TRP is currently managed. There would probably be some minor changes because we have specific management processes that are different than the way ARPA manages TRP. These details would be addressed after the congressional mandate for an Air Force dual-use program. On the other hand, the philosophy of dual-use development, mandatory cost sharing concepts, smart buyer of commercial off-the-shelf hardware, awareness of commercial industry strategies, and helping our defense Industry make commercial goods to offset downtrends are excellent ideas and should continue to be embraced. The bottom line will be to ensure that dual-use programs are militarily relevant.

DUAL-USE PROGRAMS

Senator SMITH. What projects currently undertaken within the TRP are most relevant to the service missions?

Mr. FIESTER. The most relevant projects to the Air Force's mission are those focus areas that address aerospace-related technologies such as aircraft avionics, space sensors, materials, etc.

SERVICES' S&T PROGRAMS

Senator SMITH. Mr. Fiester, we have generally considered investments in the services' Science and Technology Programs to have potential payoffs in the longer term. All your presentations describe the use of Advanced Technology Concept Demonstrations as a means to make advanced technology available to the field much more quickly. Are there other means that the services are using to make technology available to the field much more quickly?

Mr. FIESTER. Yes. The Air Force has established a master planning process that involves the laboratories, system development centers, and the operational users. The new planning process focuses technology development on warfighter needs. The laboratories, system development centers, and operational users working together ensure that information on technologies and technology options is available to all applicable organizations. In addition, the Air Force laboratories contract out about 80 percent of their Science and Technology (6.1, 6.2, and 6.3) funds with industry. This high contracting out ratio puts the technology development into industry early in the development process. The Air Force relies on industry to build our systems and, since they are already familiar with new technologies, they feel confident in incorporating new technologies into developmental systems and fielded system upgrades.

Senator SMITH. Are these efforts a reflection of the degree to which the CINCs have grown In importance under Goldwater-Nichols?

Mr. FIESTER. The Goldwater-Nichols Act, in addition to other factors, has had a positive influence on focusing technology development for the CINCs' needs. The warfighter is the ultimate technology user and we place great importance on having operational users participate in long-range technology planning.

Senator SMITH. Does the increasing influence of the CINCs present new management challenges in trying to balance near-term with long-term initiatives in the services' Science and Technology (S&T) programs?

Mr. FIESTER. Yes. We all face a management challenge when balancing near-term with long-term S&T program initiatives. Due to the limited number of new system developments, we are focusing the S&T program on both fielded system upgrades and new system developments. The current investment strategy shifts the balance slightly to technology development that will provide demonstrated options for fielded system upgrades.

TECHNOLOGY BASE PROGRAMS

Senator SMITH. Mr. Fiester, as I have stated in my opening statement, the technology base programs may be under great pressure because of the desire to address short-term readiness concerns within a limited budget. I am willing to grant, for the sake of argument, that the administration has carefully weighed the programs in the President's Budget request before sending it to us, but reductions from that request may be forced on us. If that scenario occurs, what are the four or five activities, initiatives, or programs that we must strive to protect to the greatest extent? What is your basis for determining these priorities?

Mr. FIESTER. The continuing success of the Air Force Science and Technology Program in providing superior technology options for our warfighters is due to its broad and balanced approach to technology investment. We cannot accurately predict where the next military threats or breakthrough opportunities lie. Due to this uncertainty, we must continue to resist the temptation to "pick winners." Instead, we must continue to invest our available resources in a broad and balanced set of militarily relevent generic technologies that address current and future Air Force warfighting capabilities.

Senator SMITH. Mr. Fiester, by the same token, if we are able to free up more resources for the technology base, where are the areas of greatest additional need or potential payoff?

Mr. FIESTER. The Air Force investment in the technology base adequately addresses warfighter needs. Therefore, we do not advocate additional resources for the Air Force technology base program.

SBIR

Senator SMITH. Mr. Fiester, the Small Business Innovative Research (SBIR) program is a tax on your R&D accounts to ensure a role for small business in providing R&D to the Department of Defense (DOD). The percentage available for the program is now 2.5 percent of R&D funding. Have you succeeded in integrating the SBIR program into your general Science and Technology (S&T) Program? If so, how, given the criticism concerning the utility of the program for DOD over the last several years?

Mr. FIESTER. We are confident that the SBIR program is an integral part of the overall S&T Program. As with any high risk technology developments, there are both successes and failures. The overall management objective is to maximize successes. The SBIR program serves the goals of our S&T Program by awarding funds only to those proposals which are technically sound and have a high potential for military payoff. For example, a recent SBIR effort sponsored by the Materials Directorate of Wright Lab has led to a new process for making high-quality single crystal silicon carbide wafers in bulk. This technology is important for making affordable, high-temperature electronics for use in next generation sensors, aircraft engines, and radar systems.

CONTRACTING AUTHORITY

Senator SMITH. Mr. Fiester in the Federal Acquisition Streamlining Act of 1994, 10 U.S.C. 2371 was modified to give the services greater flexibility in the use of contracting authority outside the Federal Acquisition Regulation. What plans do the services have to use this authority in the future in areas like dual-use technology development with cost sharing?

Mr. FIESTER. In the Federal Acquisition Streamlining Act of 1994, 10 U.S.C. 2371 provided the authority to the Air Force and others to enter into cooperative agreements with industry. The Air Force has delegated this authority to the laboratories. The Air Force is training contracting officers and Science and Technology professionals on how to proficiently use cooperative agreement in the technology development process. The Air Force sees cooperative agreements as an effective way to develop military technology with industry. The Air Force gains by leveraging industry to help the warfighter and industry gains by being able to apply Air Force technology and technical know-how to develop commercial products.

RDT&E SUPPORT

Senator SMITH. Mr. Fiester, the Air Force has projected a significant decrease in its RDT&E budget after fiscal year 1996. Despite this, the request for RDT&E support, that is the infrastructure, increased in fiscal year 1996 and is proposed to level off in fiscal year 1997. How do you justify this high level of expenditure on infrastructure at a time when the program budgets are declining? Does the Air Force have a plan for consolidation in the long term that will be reflected in lower infrastructure budgets? When will the impact of consolidation be evident?

Mr. FIESTER. Historically the Air Force has always enjoyed technological superiority over its adversaries. This advantage has served the Nation well. To maintain this technological edge in our weapon systems, we must invest substantial amounts in those leading areas of science. Much of the money we are talking about does just that—invest in the basic sciences and facilities that will form the building blocks of the next generations of weapons systems. This investment is necessary for the long term technical superiority of our forces.

In real terms (constant fiscal year 1995 dollars) the RDT&E infrastructure budget actually decreased $168 million in fiscal year 1996 relative to fiscal year 1995. The infrastructure budget, which peaked in fiscal year 1987 at around $3.0 billion is now around $2.3 billion, a 25 percent decrease.

Also, we have reduced the T&E infrastructure by downsizing in place and streamlining our management of test locations to three major test centers. Recently, BRAC consolidated Air Forces Electronic Combat capability at one location. Also, we will continue to support the Tri-Service Executive Agent Board of Directors efforts to streamline and consolidate the T&E infrastructure across DOD.

DUAL-USE PROGRAMS

Senator SMITH. Mr. Fiester, what is the method by which each of your services has input into the selection of projects and focus areas in the core dual-use program managed by ARPA?

Mr. FIESTER. The Air Force works very closely with ARPA in focusing and selecting technical efforts in the core dual-use program. Air Force Science and Technology personnel, in selected areas, act as agents for ARPA program managers by providing technical input into the focus area and by evaluating proposals received during the competition. In addition, the Air Force manages selected projects throughout their entirety for the ARPA program manager.

QUESTIONS SUBMITTED BY SENATOR TED KENNEDY

ROLES AND VALUE OF FFRDCS

Senator KENNEDY. Dr. Kaminski, I would like to ask about current Defense Department policy toward the defense federally-funded research and development centers (FFRDCs). As you know, the budget for these centers has dropped 28 percent since fiscal year 1990, while the Department's RDT&E has dropped only 12 percent. In, addition, legislation over the past several years has placed operating restrictions on the FFRDCs, limiting their freedom of action in how they manage themselves.

Moreover, the Defense Authorization Act for Fiscal Year 1995 mandated a Defense Science Board study on how FFRDCs can best serve Department needs in the years ahead. Clearly, defense FFRDCs are at a crossroads, and their future roles and functions will be determined over the next several years.

Would you please state your view of the role and value of defense FFRDCs? What are the three types of defense FFRDCs and the specific differences—their mission and operation? What is the rationale for maintaining such organizations that are private non-profit entities that do not have to compete for DOD contracts? What would be the impact on the Department's RDT&E capabilities if FFRDCs were eliminated.

Dr. KAMINSKI. I believe that FFRDCs are a vital part of the scientific, engineering and analytic industrial base available to the DOD. They represent a valuable source of independent and objective technical and intellectual expertise. I fully support the continuing need for and use of FFRDCs to address DOD needs.

DOD FFRDCs are classified into three categories—studies and analyses centers, systems engineering and integration centers, and laboratories. They differ in size, mission, and technical and analytic focus. A brief description of each follows:

- *Studies and Analyses (S&A) Centers*: S&A centers were created and exist to deliver independent and objective analyses and to advise in "core" areas important to their sponsors in support of policy development, decisionmaking, alternative approaches, and new ideas on major defense issues.
- *Systems Engineering and Integration (SE&I) Centers*: SE&I centers were created and exist to provide required support not available from sponsor's in-house technical and engineering capabilities to ensure that complex systems will meet operational requirements. The centers assist with the creation and choice of system concepts and architectures, the specification of technical system and subsystem requirements and interfaces, the development and acquisition of system hardware and software, the testing and verification of performance, the integration of new capabilities and continuous improvement of system operations and logistics. They often play a critical role in assisting their sponsors in technically formulating, initiating, and evaluating programs and activities undertaken by firms in the for profit sector.
- *Research and Development (R&D) Laboratories*: R&D laboratories were created and exist to fill voids where in-house and private sector research and development centers were/are unable to meet DOD needs. Specific objectives for these FFRDCs are to: (1) maintain over the long-term a competency in technology areas where the Government cannot rely on in-house or private sector capabilities, and/or (2) develop and transfer important new technology to the private sector so the Government can benefit from a wider, broader base of expertise. R&D laboratories engage in research programs that emphasize the evolution and demonstration of advanced concepts and technology, and the transfer or transition of technology.

The FFRDCs exist because of a desire to capitalize on the private sector in a way that provides for continuity of effort in key defense areas. The organizations operating FFRDCs differ from other private sector corporations that compete for DOD resources in that they accept a special set of terms and conditions to provide for a special relationship with their DOD sponsors. The overall purpose of the special relationship is to provide objective and independent technical and analytic support that operates in a relatively conflict free environment that: (1) addresses issues integral to the mission of the sponsoring organization but stops short of performing inherently governmental functions, (2) is fully informed by access to Government and industry information, (3) is conducted by an organization without real or perceived pressures to conform to the institutional positions of either Government or industry, and (4) is focused solely on the public interest, without competing pressures of commercial or shareholder interests. The above description of the special relationship does much to explain why other private sector corporations that do not operate under those special terms and conditions cannot fill the FFRDC role.

Thus, FFRDCs provide independent, "outsider" perspectives on issues important to DOD, with "insider" access and focus on the public interest, rather than financial profit. This combination provides the Department a valuable resource that would not be easily replaced via any other mechanism. The Department would be significantly and negatively impacted if the FFRDCs were eliminated.

BASIC RESEARCH

Senator KENNEDY. Dr. Kaminski, you have made a strong case for the importance of maintaining a robust defense industrial base to support our military's technological edge over the years and decades ahead. What is the value of basic research in achieving that goal? Would you cite specific examples of how basic research contributes to our defense capability? What is the impact of the basic research program on maintenance of a skilled work force in the defense sector?

Dr. KAMINSKI. Recently, scientists in the Army created the apt expression "Owning the Night," thus capturing the thought that the United States has the world's best night vision equipment. The phrase expresses most effectively the essence of the Department of Defense (DOD) Science and Technology (S&T) Strategy; superiority. Superiority means buying the F–117 Stealth Fighter, Laser Guided Bombs, the Global Positioning System, and "Owning the Night" with thermal sensors and night goggles. Only one country has been able to do that, and it was accomplished because of major discoveries in DOD basic research.

Our technological superiority begins with basic research focused on the physical sciences, mathematics, and engineering essential to improving our warfighting capabilities. A large part of defense basic research is done at universities with world-class education and research second to none. Increasingly, research teams involving universities, industry, and government labs are providing the innovation for military technology in such areas as lasers, electronics, computing, and materials. Science magazine reports that over 35 percent of all patents issued to industry are the result of collaboration with universities, and the percentage is growing. These trends not only help to expedite transition of research into development but also promote the exchange of ideas and talent.

Although DOD accounts for only 9 percent of all basic research sponsored by the Government, the Department dominates Federal investments in several defense-critical fields including computer sciences, electronics, optics, materials, aerospace engineering, and oceanography. The research program supports about 9,000 graduate students a year in the core research activity and through special fellowship and traineeship programs. This is a major resource to DOD and the Nation, supplying the scientists and the science for the next generations of defense technology.

The attachment describes several accomplishments of the research program.

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DOD-SPONSORED UNIVERSITY BASIC RESEARCH AND ITS CONTRIBUTION TO DEFENSE SYSTEMS

Department of Defense (DOD) support of basic research at Universities has produced many key advances in science and engineering leading to increased performance, lower cost, improved manufacturability, reliability, and miniaturization of DOD systems. In some cases, research has developed novel concepts which formed the basis for entirely new systems (e.g., the laser). The following are examples of a wide range of important university accomplishments, with roots in basic DOD research, which have impacted warfighting capability, affordability, and operations.

Enhanced Warfighting Ability

In complex computer software, one part of a program may require information before it's available. In the past, conflicts such as this limited the reliability of computer based sonar control in the *Seawolf*-class submarine. Sonar control has been improved markedly with rate-monotonic computer algorithms developed by a research team led by Carnegie Mellon University. The technique has also been applied to the Navy LAMPS helicopter landing system and NASA Space Station.

Discriminating between acoustic signatures of military targets and undersea clutter is a difficult and tedious problem for Navy sonar operators. Their job has been made easier and more accurate with the introduction of neural network software developed from research at the Massachusetts Institute of Technology (MIT) and the Oregon Graduate Institute.

The Global Positioning system (GPS) was used by our forces in Desert Storm to navigate in the desert. GPS depends on satellite-based, very high precision atomic clocks enabled by the defense research of Zacharias at MIT, Ramsey at Harvard, Dehmelt at University of Washington, and others.

The range and sensitivity of the radar of the Patriot missile depend on highly stable electronic devices. Research on vibration-insensitive surface acoustic wave (SAW) devices at Rensselaer Polytechnic Institute resulted in improvement of sensitivity and extension of effective range.

In the past, military infrared imagers used low efficiency cryogenic coolers to keep the sensors at liquid nitrogen temperatures. Coolers are now light and efficient because they use small, very powerful magnets developed at the Universities of Pittsburgh and Dayton. These magnets are also key components of traveling-wave-tubes (TWTs) used in the Patriot radar system.

Control system theory was developed in DOD-sponsored basic research by Kalman and Bucy. This theory is widely used to design military systems such as phased-array radar, missile trackers, and inertial guidance systems, and is part of all electrical engineering curricula taught in universities.

Professor Charles Townes, Nobel Prize winner, attributes his discovery of the laser (which led to the development of the laser), to defense-sponsored research at Columbia University. This work resulted in the high and low-power lasers used in military systems, such as range finders, optical jammers, and precision-guided weapons.

Cost Abatement

Wind tunnels are used in the design of new Air Force agile, high-speed aircraft. Designs are limited by the capability of model manipulators to emulate the motion of advanced aircraft. An advanced manipulator, developed at Georgia Tech, uses tunnel wind to permit evaluation of larger models and more complicated maneuvers in designing future aircraft.

As electronic circuits shrink and become more complex, the need for reducing the electrical resistance of the interconnections becomes critical. Cheaper, more durable military electronics have been achieved through the use of low-resistance electrical connections (ohmic contacts) developed in a basic research program at CalTech.

The long testing times and high costs for the testing in development of missiles as SADARM and MLRS, have been reduced by one-third. This has been achieved through the development of automatic trackers in a DOD-sponsored research program at New Mexico State University in collaboration with White Sands Missile Range.

Most integrated circuit (IC) designs used in military hardware are now simulated before they are first fabricated, thereby saving expensive trial-and-error design and test. DOD research sponsored at the University of California at Berkeley, resulted in SPICE, a major development in circuit simulation software. SPICE is now used by all integrated circuit designers for both military and commercial electronics.

Also in the area of ICs, Stanford University conceived modeling and software methods for silicon IC manufacturing processes, leading to a process simulator called SUPREM. SUPREM and its variants are widely used in the semiconductor industry for civilian and unique military needs; it was used, for example, in developing the radiation-hardened memory chips in Raytheon's Trident missile.

In the 1970s, Carver Meade at CalTech developed the fundamental design principles and circuit elements for gallium arsenide transmitter-receiver modules. The ground based radar for the THAAD theater ballistic missile defense interceptor uses 20,000 of these modules to guide the weapon to the target.

Operations

Rapid target tracking for defense against missile attack was enabled by basic research on fast fourier transforms (FFT) by John Tukey of Princeton University. This high speed mathematical algorithm reduces the time for effective tracking by up to 10,000 times for complex scenarios in systems such as Patriot and Pershing. The FFT has greatly increased efficiency and reliability in communications, radar, speech and image processing, manufacturing, and control systems in both military and civilian applications (e.g. medical imaging).

Georgia Tech and McDonnell-Douglas Aerospace learned how to use active control on fluid-dynamic instabilities in jet flows and thus to direct hot exhaust gases (from C–17 aircraft engines) away from ground service personnel during engine-on loading and unloading operations. If additional tests by McDonnell-Douglas are successful, it may be possible to replace the C–17s core flow thrust reversers, thereby reducing weight and allow the increase of payload by 3,000 pounds.

Purdue University's research on prediction of crack growth has helped to lower the costs of maintenance of KC–135 tankers and transports in the program on Life Extension of Aging Aircraft at the Oklahoma City Air Logistics Center.

Early efforts by the Army to use high-strength steels were plagued by stress-corrosion cracking (SCC) failures. Professor Herbert Uhlig at MIT determined why such steels fail and how to minimize SCC, leading to the development of new steels which are more resistant to SCC. These steels have been utilized on the Blackhawk and Apache helicopters, The Bradley Fighting Vehicle, and the Chaparral, Hawk, Hercules, and Sparrow Missiles.

MIT's research on active control of instabilities in turbine engines led to a retrofit of the F–110 engine, which is used in the F–16 fighter, extending the life of the engine's compressor stage up to 20 percent.

Naval underwater salvage operations have greatly improved with the development of an optical unmanned search system (ARGO-JASON). The system, developed by scientists at the Woods Hole Oceanographic Institute, has been used to find sunken ships such as the Thresher and the Titanic as well as downed aircraft.

Virginia Polytechnic Institute and Carnegie-Mellon University have developed intelligent, computer-based instructional systems which the Navy and the Air Force use to train personnel in operation and maintenance of equipment. This has resulted in cheaper, more effective training, and a reduced need for military instructors.

Degradation of helicopter turbine engines by foreign particle ingestion resulted in the failed hostage rescue effort by American forces in Iran. University of Cincinnati research on degradation processes in turbomachinery has resulted in new erosion-resistant designs for the T–700 engine of the Apache and the T–800 engine of the Comanche helicopters.

Most military space communications use coding and decoding hardware are based on research done by Andrew Viterbi at the University of California at Los Angeles. The Air Force uses the Viterbi algorithm in its satellite communication systems. NASA has also made extensive use of this tool in missions such as the Voyager flights

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QUESTIONS SUBMITTED BY SENATOR JEFF BINGAMAN

EFFECT OF RESCISSION OF TECHNOLOGY REINVESTMENT PROJECT FUNDS

Senator BINGAMAN. Dr. Kaminski, as you know the appropriations committee are about to rescind $200 million of the fiscal year 1995 TRP funds. I and other members of this subcommittee have expressed concern about this rescission. Could you comment on the impact this will have to the TRP program and the need to fully fund the program for fiscal year 1996?

The cost-sharing and competition requirements of the TRP have been effective in producing quality proposals. Industry would not be investing large amounts of its own funding if the projects were not worthwhile. Some people, however, have criticized the TRP by saying some of the projects are not relevant to the needs of the services. My impression is that the relevance is pretty high. Can you comment on this?

Dr. KAMINSKI. The TRP program is a defense program, run by the Department of the Defense, for the benefit of the military. I expect that every dollar that we invest in TRP comes back to us in equal military capability at more affordable prices or increased capability at an equal price. Now, industry is sharing the costs of these projects and they expect a return on their investment that will put them in a better competitive position in commercial markets. Both sides win. The critics you hear are looking at only half of the story and their conclusion is wrong.

A reduction of $200 million in fiscal year 1995 will fundamentally change the character of TRP. As you may know, we were preparing for a $500 million competition just as the issue of rescission arose. A $200 million cut would mean that whole categories of activity would have to be dropped. My guess is that we would want to drop first those activity areas that have the longest term benefit to defense, the deployment and education categories, in favor of those with the most immediate and direct benefit, dual-use technology development.

ACQUISITION INFRASTRUCTURE COSTS

Senator BINGAMAN. Dr. Kaminski, as I mentioned in my opening statement, I am concerned about the Department's failure to reduce its acquisition infrastructure costs. I know from conversations that we have had on this subject that you are concerned as well. I had hopes that BRAC 95 would reduce the infrastructure by forcing some consolidations, but there were very few reductions in this last BRAC list. What do you plan to do to get these very expensive costs under control?

Dr. KAMINSKI. The Secretary's recommendation to the BRAC commission contains 13 laboratory activities (1 Army, 9 Navy and 3 Air Force) recommended for closure as a result of BRAC 95. Detachments or components of five other Navy lab activities are also being closed.

Some of the laboratories being closed also perform Test and Evaluation (T&E) activities. In addition, BRAC and Project Reliance, combined with increasing budget pressures, have resulted in closures and realignments for our lower priority T&E facilities and organizations. Such actions have resulted in a 30 percent decline in T&E infrastructure funding since 1990

As we learned in BRAC 95, cross-servicing is very difficult. Part of this difficulty stems from the fact that a service's roles and missions are determined in part by its technology, weapon systems, and ability to effectively perform new functions. The services are therefore reluctant to eliminate infrastructure that is critical to developing and maintaining operational excellence.

The National Science and Technology Council (NSTC) is completing its review of the RDT&E infrastructures of DOE, NASA, and DOD. The agency reports to NSTC indicate that excess capacity is not solely a DOD problem. Future BRAC-like processes may realize greater efficiencies by looking across the national capability vice that of a single agency.

CONSOLIDATION IN TEST AND EVALUATION INFRASTRUCTURE

Senator BINGAMAN. I am concerned that the DOD Test community has not forced the services to do some consolidation in Test and Evaluation infrastructure. It's almost as if each service has a set of installations that they try to use no matter what. I found out recently that an Air Force Base was rated low in certain aspects in the BRAC process because it was not near areas where the Air Force can fly supersonic, yet it is very close to thousands of square miles of Army range where supersonic flight is okay. Why can't the Air Force fly supersonic there? In another case I was told 5 years ago that all of the sled testing for the DOD would be consolidated at one location. Five years later this has still not been done. What can we do to get the services to cut back on these test facilities and cooperate more?

Dr. KAMINSKI. Within the Department we have been very concerned about the size of the infrastructure and its downsizing relative to trends in the other aspects of our budget. Even though the test and evaluation (T&E) infrastructure comprises less than 2 percent of our total infrastructure we have had various on-going efforts to try and balance our T&E needs against other needs. Our efforts include establishing Project Reliance to create a mechanism that allows the Services to rely on each other for T&E support rather than requiring each service to maintain capability to support its mission when such capability would unnecessarily duplicate capabilities in other services. We also have a Board of Directors (BoD) for T&E comprised of the Vice Chiefs of Staff of the services to provide a joint review of T&E capabilities. These mechanisms have resulted in significant reduction in facilities and organizations devoted exclusively to T&E.

For example, the Army is closing Jefferson Proving Ground and portions of the High Energy Laser Systems Test Facility, eliminating the commodity T&E boards, eliminating the T&E mission at Fort Hunter-Liggett, downsizing Dugway Proving Ground, and consolidating the Electronic Proving Ground management. The Navy is closing the Naval Air Propulsion Test Center and consolidating its Naval Air Warfare T&E centers. The Air Force disestablished its 4950th Test Wing, is eliminating the T&E mission from the Utah Test and Training Range and consolidating electromagnetic and electronic coat test facilities at Edward AFB, and is eliminating threat facilities of Eglin. Overall the RDT&E funding for T&E infrastructure will decline 30 percent in real terms between 1990 and 1997 and we expect that trend to continue in the future if workload projections support continued decline. The mechanisms in place are resulting in close cooperation among the services and will result in further changes in the size of the T&E infrastructure.

Last year the decision regarding the consolidation of sled testing was put on hold to avoid interference with the 1995 BRAC deliberations but now that the BRAC recommendations are behind us we can proceed. The BoD is looking at the sled track issue and will report out this year. In any case the cost of these facilities is very minor and any consolidation will result in very little savings.

With regard to the Air Force flying over Army ranges, safety considerations, instrumentation capability, geographic and terrain features and particular mission retirements may preclude such activity. For example, if aircraft must routinely be able to drop live ordnance or fly low level supersonic within an area we could not let that be done where ground troops were routinely deployed for training. However, I can assure you that the services routinely use each others facilities when it is advantageous.

FFRDC COMPENSATION

Senator BINGAMAN. Dr. Kaminski, before you took your present position we had a serious problem with the level of effort at the FFRDCs. The DOD budget was declining and yet the FFRDC program got bigger each year. After we put spending limits on, the Department's FFRDC program the level of work finally began to decline. Last year there were serious concerns about the compensation levels for senior people at the FFRDCs. This subcommittee and the full Armed Services Committee called for a compensation review. Other committee's however, went further and enacted limits on the compensation of FFRDC employees. Have you reviewed this situation? Will you be enforcing the compensation limits? How do you plan to deal with this issue?

We are worried that this FFRDC issue is turning into a case of throwing the baby out with the bath water. FFRDCs provide valuable and needed services to the DOD. I am beginning to worry that this compensation limit will be a crippling blow. I know that the Defense Science Board compensation review is not complete yet but can you comment on the reasonableness of the current legal limit on compensation?

Dr. KAMINSKI. A Task Force of the Defense Science Board is currently reviewing, at the request of the Congress, the role of the FFRDCs in the mission of the Department of Defense, to include compensation limitations on FFRDC employees and its impact on FFRDC quality and capability. The results of that review will be available by May 1. However, DSB findings to date indicate that "congressionally mandated salary constraints that are unique to the FFRDCs are inappropriate and will lead to a significant degradation in the competence and quality of the individuals and organizations if left in place."

As required by last year's legislation, the Department has entered into agreements with the FFRDCs concerning limitations on compensation and other matters. While we have complied with the compensation limitations, we believe that restrictions on compensation at the FFRDCs are inappropriate. The Department has commissioned an independent review of the compensation of executives and senior managers at DOD sponsored FFRDCs and their parent organizations, and that review indicates that compensation levels are not out of line. I intend to provide the results of that study to the Congress and will seek congressional approval of our fiscal year 1996 Budget Request which removes the FFRDC-unique compensation limitations.

CONGRESSIONAL EARMARKING

Senator BINGAMAN. Dr. Kaminski, over the past few years this subcommittee has made significant progress in reducing the amount of congressional earmarking that is done by the Congress in the tech base accounts. Sometimes we have had good cooperation from the administration and other times we have been frustrated when people in the Pentagon agree to fund these projects without the competition we write into the law. We know the pressure these earmarks put you under and do not expect you to be able to resist all the earmarks but will you work with us to help us enforce the requirements for competition we on this committee place into the law?

Dr. KAMINSKI. Yes, I will do everything possible to help. However, when an earmark is directed by subsequent legislation, we must comply with the terms of the law.

UNIVERSITY RESEARCH FUNDING

Senator BINGAMAN. Dr. Kaminski, DOD amounts for over half of the total Federal funding for university research in certain sectors like engineering and computer science. For example, in fiscal year 1994 DOD funded 58 percent of all Federal research in electrical engineering. Are you concerned about the tendency that some have shown in recent weeks to make serious cuts to DOD programs that support University Research?

Dr. KAMINSKI. Yes, I am very concerned. Our technological superiority begins in our universities, with world-class education and research second to none. That research focuses heavily on the physical sciences, mathematics, and engineering essential to improving our warfighting capabilities. In the past 15 years, science and engineering research at universities has grown to fill the vacuum left as American industry trims its research; universities are now the best game in town. They have become partners with industry in providing the innovation for military technology in such areas as lasers, electronics, computing, and materials. Science magazine reports that over 35 percent of all patents issued to industry are the result of collaboration with universities, and the percentage is growing.

Although Department of Defense (DOD) accounts for only 9 percent of all basic research sponsored by the Government, the Department dominates Federal investments in several critical fields including computer sciences, electronics, optics, materials, aerospace engineering and oceanography. Any significant cuts in DOD university research would seriously damage DOD's research enterprise, and become a great loss for the Nation. Other agencies could not cover the gaps created by such a cut, nor could the country soon recover from the resultant displacement of scientists and engineers in universities throughout the country.

ACQUISITION REFORM EFFORT

Senator BINGAMAN. Dr. Kaminski, I know that both you and Dr. Perry have a long record of working on acquisition reform. I know that Dr. Perry was a member of the Packard Commission in the mid 1980s and John Douglass keeps telling me what a great job you did on the Stealth fighter program, the F–117, when you were in the Air Force. Are you satisfied that the reform effort is moving along fast enough? Is there more we can do to help?

Dr. KAMINSKI. I am satisfied that the Department has moved implementing the Federal Acquisition Streamlining Act of 1994, in developing a plan to change the way we do business, and in attacking the cost drivers associated with the DOD-imposed regulatory cost premium. I would hope that the Congress would continue their strong bipartisan support for defense acquisition reform in this year's legislative proposals as was demonstrated in last year's enactment of the Federal Acquisition Streamlining Act.

ARPA OTHER TRANSACTIONS AUTHORITY

Senator BINGAMAN. When we met a few weeks ago to discuss your technology and industrial base planning, you mentioned how well ARPA was using the other transactions authority in the Tier II plus UAV program. That is being done under a 3 year trial pursuant to section 845 of the Fiscal Year 1994 Defense Authorization Act. Do you think we should make that authority permanent based on ARPA's experience so far?

Dr. KAMINSKI. Results thus far have been encouraging. We would like to continue ARPA's trial period through the end of the century to more fully evaluate the appropriate role for this novel authority.

HISTORICALLY BLACK COLLEGES AND UNIVERSITIES AND MINORITY INSTITUTIONS

Senator BINGAMAN. Dr. Kaminski, we notice that you have significantly cut back on the funding for Historically Black Colleges and Universities and Minority Institutions. Last year we authorized $40 million and the Appropriations Committees cut the programs back to $20 million. Now you have further reduced funding to below $15.0 million. Could you tell us why these rather drastic reductions?

Dr. KAMINSKI. DOD was appropriated $25 million for this program in fiscal year 1995. The Senate Armed Services Committee recommended $35 million. After the $200 million university cut and DOD reductions in SBIR, FFRDCs and other research programs, there was approximately $22 million remaining. A broad agency announcement was issued and awards were made for $14.2 million. Another broad agency announcement has been issued, which will close on June 1, 1995, for the award of the remaining $7.8 million. Accordingly, there have been no drastic reductions in this program.

DEFENSE TECHNOLOGY AND INDUSTRIAL BASE REPORTING

Senator BINGAMAN. Dr. Kaminski, during your confirmation hearing and during subsequent conversations you have indicated that you would work with the Congress to propose more effective reporting on the Defense Technology and Industrial

Base. I recall that recently you wrote to the full committee recommending the elimination of the old reporting requirement. Have you developed a new report that you believe is more effective or do you just want to stop reporting on the Industrial and Technology Base altogether?

Dr. KAMINSKI. Chapter 148 of title 10, United States Code, establishes the congressional policy designed to ensure the ability of the national technology and industrial base to support the Nation's national security requirements. It does this by setting up organizational structures, annual assessments, annual plans, and reporting requirements. The Department fully supports the policy objectives of chapter 148. The Department believes, however, that those objectives best would be met by performing only those analyses and establishing only those organizations necessary to support the Department's key budget, acquisition, and logistics processes.

By the end of this month the Department will submit to the Congress draft legislation to revise chapter 148. The draft legislation will propose fundamental industrial assessment improvements which will ensure a robust technology and industrial base fully capable of meeting future national security requirements. The proposed legislation, among other things, will require the Department to provide an annual report to Congress, for 3 years commencing in 1996 to enable Congress to monitor technology and industrial issues. The report would include descriptions of the Department's policy guidance, the methods and analysis used to address technological and industrial concerns, and assessments used to develop the Department's annual budget submission. It would also identify any programs designed to sustain essential technology and industrial capabilities.

MANUFACTURING SCIENCE & TECHNOLOGY

Senator BINGAMAN. Mr. Decker, Ms. Slatkin, Mr. Fiester, as all of you know we have had a long "debate" over the MANTECH program. This subcommittee has favored competition and cost sharing unless the program in question has no commercial value. This debate has been complicated by the fact that the Navy has permanent MANTECH "Centers" and the Air Force and Army execute their programs through a series of contracts. In the case of the Air Force the program has been further complicated by the fact that certain organizations (NCMS if you want to mention names) have taken up a large part of the budget by getting earmarks from the appropriations committee. Could you give me your views as to where this program is headed this year? I notice the budget request is significantly lower than last year, and are you losing interest in the program?

Mr. DECKER. No, the Army has not lost interest in the Manufacturing Science and Technology (MS&T) program. We recognize that much of the most current technology is developed by, and resides with, industry. The Army MS&T program seeks to leverage these state-of-the-art technologies to address genuine military needs, specifically the affordability of our weapons systems and modification to these systems. It is important to note that the MS&T program continues to emphasize solutions to important weapons system manufacturing problems. However, to maximize the potential payoff, we will move toward working manufacturing issues earlier in the development cycle, such as those identified during our Advanced Technology Demonstration (ATD) program. Expenditures at this stage of development will fill the need to address affordability early, to effect the greatest cost savings thereby bringing completed ATD programs to the Program Managers, demonstrating both desired performance as well as the ability to manufacture.

The Industrial Preparedness and Manufacturing Technology Program was shifted from Research, Development, Test and Evaluation (RDT&E) Defense-wide to RDT&E, Army through Program Budget Decision (PBD) 630. Within RDT&E, Army MS&T funds were transferred from Budget Activity 7 to Budget Activity 3 to reflect the science and technology emphasis of these efforts. Our budget request for this program for fiscal year 1996 is $17.8 million. The Army appropriation in fiscal year 1995 was $35.3 million, of which $16.2 million was earmarked by Congress.

The Army has an active role with the other services, Defense Logistics Agency, and Advanced Research Projects Agency in the Joint Directors of Laboratories (JDL) MS&T panel. Key outcomes from this joint service/agency synergy have been identification of areas of mutual manufacturing interest and leveraging of funds. A recent review by the JDL MS&T panel indicates that 67 percent of the MS&T projects planned for fiscal year 1997 are joint in some aspect.

Finally, we view the manufacturing Centers of Excellence (COE) as a significant part of the MS&T program for all services in process development. These centers offer a unigue collection of capabilities to work pervasive manufacturing issues. The Army fully intends to continue integrating COE capabilities where it makes sense.

ACQUISITION REFORM AT ARMY LEVEL

Senator BINGAMAN. Mr. Decker, Ms. Slatkin, Mr. Fiester, one of the problems we have had in the past on Acquisition Reform has been that it just never seemed to really filter down to the services. Could each of you tell us briefly what you are doing to implement the reforms the Congress enacted last year and how you play in the Office of the Secretary of Defense programs for regulatory reform managed by Dr. Kaminski?

Mr. DECKER. Personnel from the Department of Defense (DOD), to include the services, and Agencies are members of the Federal Government teams currently writing the implementation instructions for the Federal Acquisition Streamlining Act (FAStA) of 1994. It is likely that all the instructions will be published ahead of the schedule mandated by the Act.

FAStA seeks to remove many of the statutory barriers that hindered many commercial companies from selling to the U.S. Government. The DOD and services are doing their part to streamline our internal processes and to remove self-imposed regulatory barriers restricting our access to commercial technologies and products. I am proud that the Army is a leader in these efforts. We began, several years ago, to remove Government unique specifications and standards, and excessive paperwork requirements from our solicitations. Such requirements often added unnecessary costs and kept the most efficient producers with the best technologies from bidding. This was not good for the taxpayer nor the soldier.

Using successful commercial business practices and technologies requires a profound cultural change in our acquisition work force. New and different skills are also required if the reforms are to succeed. In 1992 the Army embarked on a series of 2- or 3-day training sessions known as Road Shows aimed at achieving a cultural shift and providing the skills necessary to make it stick. By the end of this summer over 10,000 Army acquisition personnel will have attended. Senior Army acquisition leadership, civilian and military, attend and lead each session. Herein lies the reason I believe, this time, acquisition reform will become a reality. Lasting significant change requires committed leadership at all levels. Today, for the first time, we have that commitment from the executive branch, the legislative branch, and senior DOD leadership.

We are full partners with Dr. Kaminski and his staff in regulatory reform. Again I am proud to report that three of the five major DOD Process Action Teams were chaired by Army members (Specifications and Standards Reform, Contract Administration, and oversight and Review). We are on a fast track implementing changes recommended by the teams. We have canceled 17 of 41 Army Acquisition regulations and the remainder are under review. We have drastically reduced the number of unique military specifications and standards in our major acquisitions, some to zero. Data and report requirements are routinely reduced seventy percent when compared to traditional solicitations.

We are working hard to improve our acquisition process and business practices. We are looking forward to working with Congress in creating a world class acquisition system providing the best equipment and material to our soldiers.

POTENTIAL SSDC ACTD ONCE NAUTILUS TESTS ARE COMPLETE

Senator BINGAMAN. Mr. Decker, as you know this committee last year strongly supported General Garner's Nautilus initiative with the Israeli Ministry of Defense. My understanding is that consideration is now being given to launching an advanced concept technology demonstration (ACTD) once the Nautilus tests are complete.

I want you to know that I think that this is a real opportunity to leverage the multi-billion BMDO investment in high energy chemical lasers to meet the Army's needs to deal with low cost rockets, Unmanned Aerial Vehicles, cruise missiles and anti-radiation missiles on the battlefield. The Army's needs are well within the range of already demonstrated technologies. So I want to encourage you to work with General Garner in this area and I'd appreciate any comments you might have on how this program might proceed.

Mr. DECKER. The Army is heavily involved in the testing of high energy lasers (HEL) at the High Energy Laser Systems Test Facility (HELSTF) as a service to programs that do not belong to the Army. Although the Army has an interest in the potential applications of HEL, as evidenced by our participation in Nautilus which examined a system like Tactical High Energy Lasers (THEL) as one alternative, we have restricted our investment to low power laser technology in recent years due to affordability constraints. In the spirit of Project Reliance, the Army has chosen to follow the other services in terms of high energy laser development where higher priority applications, such as ship defense and boost phase intercept, have been pursued.

The Army will invest in the highest priority requirements as we see them, subject to Army Total Obligation Authority constraints. In this era of constrained resources, a number of potentially good ideas, including Nautilus, have not reached sufficient priority to be funded. As, more resources become available or the priority of Nautilus changes, we will, of course, reevaluate the situation.

RDT&E MAnagement and support

Senator BINGAMAN. Mr. Decker, Ms. Slatkin, Mr. Fiester, how do you folks reconcile the difference in your acquisition infrastructure accounts? Do you get together to reconcile these differences? Mr. Decker, why for example does the Army, which has about half the investment in R&D of the Navy, have twice the investment in infrastructure costs compared to the Navy?

Mr. DECKER. The services review their acquisition infrastructure accounts individually as part of their total Research Development Acquisition (RDA) planning, programming and budget development processes. These accounts are then reviewed by the appropriate Office of the Secretary of Defense (OSD) staff elements for balance and policy compliance.

I am however aware that each service programs and budgets for it's budget activity 6 (Management Support) cost differently. These differences as well as other service unique costs account for the disparity between the Army and Navy funding for Management Support. For example, the Army's fiscal year 1996 request includes $426 million for RDT&E Base Operations; and Maintenance and Repair. The Navy funds these costs under Defense Business Operating Fund (DBOF). The Army request includes $150 million to fund Kwajalein, a unique Army requirement to test defensive missiles. The Army's request includes $79 million for Environmental Compliance and Pollution Prevention while the Navy funds these costs mainly out of their Operation & Maintenance (Non-RDA) accounts. A comparison between the Army and Air Force would yield similar results, since the Air Force also funds considerable portions of their management costs in O&M and other RDT&E accounts.

Notwithstanding these differences, the Army's RDT&E infrastructure costs are high and through BRAC and other cost reductions, notably reduction in overhead personnel costs, we must and will reduce these costs.

THE STATUS OF FFRDCS

Senator BINGAMAN. Mr. Decker, Ms. Slatkin, Mr. Fiester, the DOD FFRDCs are spread across your organizations. The Air Force however is by far the biggest user of FFRDCs. Why for example do you need Aerospace Corp to manage the Air Force space programs when you do not have a similar FFRDC managing your Aircraft and Missile programs?

Do you all think we should separate the studies and analysis FFRDCs from the, others?

Mr. DECKER. The status of all the Federally Funded Research and Development Corporations (FFRDCs) is currently under extensive review within the Department of Defense (DOD), and the Defense Science Board has been conducting an FFRDC review over the past several months. While it is premature to come to a conclusion before all these discussions are concluded, it is clear that the very important attributes that the FFRDCs have in common, much as being free of both real and perceived conflict of interest and their role as an "honest broker" in their relationships with the Department of Defense, clearly separate them from the for-profit organizations that do not share those particular attributes. Beyond that, we do tend to look upon the FFRDCs in three separate categories, the studies and analysis centers, the systems engineering centers and the research laboratories. Within those categories, the FFRDCs probably have about 80 percent of the DOD/FFRDC interface issues in common, while perhaps 20 percent of the activities are distinct. They require different oversight procedures, for example.

The Army is aware that the Air Force is taking a close look at the Aerospace Corporation to determine if any part of their activity can be opened up for bid. We are working with them to see if that same approach might be applicable for MITRE Corporation, and we will decide on these issues after the report of the Defense Science Board has been received and after we have had a full internal discussion of all the ramifications of these FFRDC issues. The end objective is to ensure that only the core business unique to FFRDCs is conducted by FFRDCs and that all non-core business is contracted out.

Senator BINGAMAN. Mr. Decker, Ms. Slatkin, Mr. Fiester, how do you folks reconcile the differences in your acquisition infrastructure accounts? Do you get together to reconcile these differences?

Ms. SLATKIN. Unlike the other services, most naval science and technology facilities operate under the Defense Business Operations Fund. This means that our science and technology activities fully fund infrastructure costs through an overhead rate charged to customer funding. Customer funding is budgeted to include infrastructure costs including equipment and minor construction. This type of funding is based on the concept of full costing in order to give managers and decisionmakers visibility into the true cost of goods and services. The ability to make informed decisions about cross-servicing or outsourcing would be increased by establishing a consistent basis for comparing costs.

Senator BINGAMAN. Mr. Decker, Ms. Slatkin, Mr. Fiester, the DOD FFRDC's are spread across your organizations. The Air Force however is by far the biggest user of FFRDC's. Why for example do you need Aerospace Corporation to manage the Air Force space programs when you do not have a similar FFRDC managing your aircraft and missile programs?

Do you all think we should separate the studies and analyses FFRDC's from the others?

Ms. SLATKIN. The Center for Naval Analyses is the Navy's only FFRDC, although we do task other FFRDC's to do studies and analyses in systems engineering. Since the Center for Naval Analyses is exclusively a studies and analyses FFRDC, I cannot comment on whether it should be separated from the other FFRDCs.

Senator BINGAMAN. Mr. Decker, Ms. Slatkin, Mr. Fiester, last year the Navy made a valiant attempt to start its own TRP program similar to the program that ARPA conducts. While we fully funded the program the Appropriations Committees did not. We were able to change the law, however, to give all of you the authority to use TRP procedures, other instruments authority, cost-sharing for partnerships, and so forth. My impression, however, is that you have done little to plan for the use of this authority. Are you planning to use this new authority to streamline your acquisition systems?

Last year we also passed legislation to give you a bigger role in shaping the so called "focus areas" of the ARPA TRP program. Have you used this larger role to shape the program? Are you comfortable with your influence over the TRP program?

Ms. SLATKIN. We will streamline the acquisition process by involving industry from the earliest stage of program development possible. This will allow them to develop commercial applications to coincide with military application.

As for shaping the focus areas, the Department of the Navy provides the Advanced Research Projects Agency with an initial list of topic suggestions. These topics are collated with those of the other services, and we look at the new list to identify topics that have naval relevance.

Additionally, Section 8096 of Public Law 103–335 provides the services a greater role in the TRP.

This section prohibits the obligation of TRP funds until the service Assistant Secretaries for Research, Development and Acquisition are full members of the Defense Technology Conversion Council as TRP Board Directors.

The provision further directs ARPA to hold a competition and choose TRP projects in focus areas selected by the Acquisition Executives of the Army, Navy and Air Force. In response to this direction, I sent a letter to DDR&E identifying overlap between Navy dual-use areas of interest and the TRP focus areas.

Since the investment there has been no meeting of the Defense Technology Conversion Council. Nor has there been documentation from ARPA concerning the service Secretaries' membership on the Defense Technology Conversion Council.

Navy representatives have, however, been assigned to the TRP Working Group, which reviews, recommends and develops a coordinated balanced program for approval by the Defense Technology Conversion Council.

Senator BINGAMAN. Mr. Decker, Ms. Slatkin, Mr. Fiester, as all of you know we have had a long "debate" over the MANTECH program. This subcommittee has favored competition and cost sharing unless the program in question has no commercial value. This debate has been complicated by the fact that the Navy has permanent MANTECH "Centers" and the Air Force and Army execute their programs through a series of contracts. In the case of the Air Force the program has been further complicated by the fact that certain organizations (NCMS if you want to mention names) have taken up a large part of the budget by getting earmarks from the Appropriations Committee.

Could you give me your views as to where this program is headed this year? I notice the budget request is significantly lower than last year, are you losing interest in the program?

Ms. SLATKIN. The Navy has not lost interest in the Manufacturing Technology Program. Our Manufacturing Science and Technology Program is the single program in the Navy which focuses on affordability. It is our intent to increase the visibility of affordability throughout the entire acquisition community. An example of this is my direction to the Advanced Amphibious Assault Vehicle program to actively engage the Navy's Manufacturing Science and Technology office to assist in the program development and evaluation of competitors to ensure affordability is one of the primary concerns of the program. We will continue to do this as other programs begin to emerge.

The fiscal year 1996 budget request for the Navy was based on several historical factors, not the least of which was the earmarking you have mentioned. Over the last several years there has been debate on the differences of the Manufacturing Science and Technology Program and the Defense Technology Reinvestment Program. It was not clear why there should be investment in the Manufacturing Science and Technology Program as well as the Defense Technology Reinvestment Program. As this debate has matured, it has become clear that the Manufacturing Science and Technology Program focuses its efforts on defense essential technology, not commercial investment. Any commercialization of a Manufacturing Science and Technology Program is coincidental. When commercialization does occur, it is most often as a result of the "push" given by the military utility of the process which is then adapted by the commercial sector. As a result, most Manufacturing Science and Technology Programs identified through the Navy Manufacturing Science and Technology planning efforts have little or no expected commercialization; only later does the commercial enterprise realize any potential benefit of the investment. This contrasts directly with the cost sharing expectations of the Defense Technology Reinvestment Program. This does not mean that cost sharing and competition do not play a large part in determining who will perform the Manufacturing Science and Technology projects.

With the noted exception of the Metalworking Center in Johnstown, PA, the core Navy Centers of Excellence, namely the Composites Center, the Electronics Center, and the Joining Center, were all competed and have some cost sharing provisions. These cost sharing provisions are normally of the "in-kind" or consortium dues costs. The Centers also have the ability to accept projects from "outside" the Government which actually means the Government leverages private funds for the good of our own weapons systems. When there is congressional direction to provide funding to a specific entity our Manufacturing Science and Technology Program office has been able to maximize this investment by technical direction and oversight of the individual projects at these performers.

Today we have but in place several initiatives to heighten the focus on defense essential technology. These efforts include the round table discussions between OSD, the services, the service's Centers of Excellence, industry representatives, and congressional staff members. We feel these discussions have provided an open forum to reach a mutual understanding of the program and its value to the Navy and other services. As part of the Joint Directors of Laboratories Reliance Panel on Manufacturing Science and Technology, the Navy has actively pursued a clearer definition of the benefits of this program within the Department of Defense. We have also initiated the effort to increase the acquisition program managers awareness of the affordability issue.

Senator BINGAMAN. Mr. Decker, Ms. Slatkin, Mr. Fiester, one of the problems we have had in the past on Acquisition Reform has been that it just never seemed to really filter down to the services. Could each of you tell us briefly what you are doing to implement the reforms the Congress enacted last year and how you play in the OSD programs for regulatory reform managed by Dr. Kaminski?

Ms. SLATKIN. The Department of the Navy is working with each the OSD Working Groups to develop regulatory implementation of the Federal Acquisition Streamlining Act of 1994. The Act establishes a requirement for a Federal Acquisition Computer Network, a computer-based source of information readily accessible to Government and private sector use. The Navy is implementing Electronic Commerce/Electronic Data Interchange (EC/EDI) in response to this requirement. EC/EDI is being established in three phases. Phase I began September 1994 and utilizes the Defense Information Systems Agency infrastructure. Twenty-nine Navy/Marine Corps sites have been identified for participation. Full linkage will be completed by August 1996.

The Department of the Navy is actively involved in working with OSD to eliminate regulations which were identified by industry as being major cost drivers in the Coopers and Lybrand/TASC Study, "The DOD Regulatory Cost Premium: A Quantitative Assessment." For example, the Department of the Navy has issued policy guidelines to program managers to significantly reduce reporting requirements and management system oversight associated with implementing cost/schedule control system criteria regulations. In addition, the Department of the Navy has nominated the Joint Stand-off Weapon to be a DOD pilot program and requested significant regulatory relief.

ACQUISITION INFRASTRUCTURE

Senator BINGAMAN. Mr. Fiester, how do you folks reconcile the differences in your acquisition infrastructure accounts? Do you get together to reconcile these differences? Mr. Fiester, also why is the Air Force increasing investment when everyone else is reducing?

Mr. FIESTER. Overall, it is an OSD responsibility to oversee the acquisition infrastructure accounts. From a T&E perspective, this is the responsibility of the Tri-Service Executive Agent Board of Directors whose function is to eliminate service infrastructure duplication.

In addition, there is unprecedented cooperation between the services and OSD on many programs. The Joint Primary Aircraft Training System (JPATS) and Joint Direct Attack Munition (JDAM), are just a few of those programs. There is also sharing of technical information, for instance on aircraft engine technology between the Air Force and Navy. I believe there are many more opportunities for sharing technical information between the services and we are working to identify those areas.

As for the Air Force acquisition infrastructure budget, it has not been increasing, it has been decreasing. The acquisition infrastructure budget is at its lowest point in nearly 20 years. Over the last 10 years, the Air Force's overall acquisition infrastructure budget has ranged from over $5.3 billion in fiscal year 1985 and fiscal year 1990, to $3.2 billion in fiscal year 1996 and fiscal year 1997 (constant fiscal year 1995 dollars). In my opinion, this is about as low as we can go and still maintain our long term technological superiority over our adversaries.

FFRDC

Senator BINGAMAN. Mr. Fiester, the DOD FFRDCs are spread across your organizations. The Air Force however is by far the biggest user of FFRDCs. Mr. Fiester, why do you think this is so? Why for example do you need Aerospace Corp to manage the Air Force space programs when you do not have a similar FFRDC managing your aircraft and missile programs? Do you all think we should separate the studies and analysis FFRDCs from the others?

Mr. FIESTER. First, let me clarify. Neither Aerospace nor any of our other FFRDCs manage any programs. Programs are managed by Government employees—both military and civil servants. The FFRDCs provide technical support and advice to the management process; all program decisions are made by Government employees.

Now, to the point of your question. Over 30 years ago the Air Force made a decision not to develop an organic engineering workforce in the space business. This decision was made because the civil service personnel system and pay scale could not attract and retain the kind of technical personnel necessary to work in what was then an emerging technology. The situation was not true in the aircraft and missile business. The commercial aircraft industry was well established and there was a sufficient civilian population interested in working for the government to sustain an organic workforce. If we now ceased to contract for the technical services the Aerospace FFRDC provides, we would have no engineering workforce at our west coast product center.

With regard to your second question, we should not separate the studies and analysis FFRDCs from the other FFRDCs. Remember, in addition to the studies and analysis and systems engineering FFRDCs we also have basic research laboratory FFRDCs such as MIT's Lincoln Laboratory. We are confident that each of our FFRDCs continues to maintain the uniqueness that qualifies it as an FFRDC under the FAR definitions. Separating the FFRDCs into categories would provide no benefit to the Air Force or the Department of Defense.

TRP PROGRAM

Senator BINGAMAN. Mr. Fiester, last year the Navy made a valiant attempt to start its own TRP program similar to the program that ARPA conducts. While we fully funded the program the Appropriations Committees did not. We were able to change the law, however, to give all of you the authority to use TRP procedures, other instruments authority, cost-sharing for partnerships, and so forth. My impression, however, is that you have done little to plan for the use of this authority. Are you planning to use this new authority to streamline your acquisition systems?

Mr. FIESTER. We are aggressively pursuing a study on how to streamline the overall acquisition process. We are considering all options for streamlining that we have authority to implement and which fit into our overall acquisition management process.

DUAL-USE PROGRAMS

Senator **BINGAMAN**. Last year we also passed legislation to give you a bigger role in shaping the so called "focus areas" of the ARPA TRP program. Have you used this larger role to shape the program? Are you comfortable with your influence over the TRP program goals?

Mr. **FIESTER**. Yes. We identified the two of the final 12 "focus areas" as most relevant to the Air Force mission and supplied the ARPA program manager with team members who help chair those particular focus areas. In addition, there is at least one Air Force person on every focus area team. The program has now evolved to the point that Air Force personnel are actually writing some of the technology "focus areas" to be included in the fiscal year 1996 competition.

MANTECH

Senator **BINGAMAN**. Mr. Fiester, as all of you know, we have had a long "debate" over the MANTECH program. This subcommittee has favored competition and cost sharing unless the program in question has no commercial value. This debate has been complicated by the fact that the Navy has permanent MANTECH "Centers" and the Air Force and Army execute their programs through a series of contracts. In the case of the Air Force, the program has been further complicated by the fact that certain organizations (NCMS if you want to mention names) have taken up a large part of the budget by getting earmarks from the appropriations committee. Could you give me your view as to where this program is headed this year? I notice the budget request is significantly lower than last year; are you losing interest in the program?

Mr. **FIESTER**. In the fiscal year 1995 President's Budget Request, the MANTECH programs of all services were consolidated in one OSD program element. Thus, the Air Force request for fiscal year 1995 was zero. However, Congress appropriated $84.3 million directly to the Air Force, earmarking $36.8 million which left the Air Force with $47.5 million for discretionary projects. In the fiscal year 1996 President's Budget Request, the MANTECH programs have been returned to the services. The Air Force request is $53.3 million—an increase over the discretionary funding of fiscal year 1995, although less than the fiscal year 1995 appropriation. The Air Force is not losing interest in the MANTECH program. It is an important program in the Air Force's affordability initiative which is focused on developing technologies that will contribute to lower life cycle costs for fielded and future Air Force systems.

REGULATORY REFORM—ACQUISITION

Senator **BINGAMAN**. Mr. Fiester, one of the problems we have had in the past on Acquisition Reform has been that it just never seems to really filter down to the services. Could you tell us briefly what you are doing to implement the reforms the Congress enacted last year, and how you play in the OSD program for regulatory reform managed by Dr. Kaminski?

Mr. **FIESTER**. The Air Force has been a leader in Acquisition Reform for several years, and our partnership with the Congress, the administration, and OSD has given us even more reform opportunities our efforts are focused in three areas: implementation of legislative reforms, support and implementation of OSD efforts, and development of our own Air Force reforms.

We are, of course, proud that the Air Force owns four of the five "pilot" programs created in the Federal Acquisition Streamlining Act of 1994. These programs are vital to reform because they allow us to test streamlined procedures—what we learn from the pilot programs will help us immeasurably in the broader application of reform to the DOD. In addition to the pilot programs, we have been working closely with OSD and the other services to implement the regulatory changes necessary to put FASA to work in the field.

On the DOD side, we have been actively supporting all of Secretary Perry, Dr. Kaminski, and Mrs. Preston's reform initiatives. We have aggressively implemented reductions in the use of military standards and specifications on our contracts, and we have played a key role in the OSD Process Action Teams that are developing a roadmap for acquisition improvements.

But it has been at the Air Force level and below where most of the Acquisition Reform action has taken place. We have used the idea of "pilot" programs to create Air Force "lead" programs—four additional programs where we are trying out new reform ideas. I have exercised my waiver authority to cut down on bureaucratic requirements; we want to encourage the use of common sense, not blind adherence to regulations. Air Force Material Command has been a pioneer in Integrated Product Development and Teaming—one of the most important organizational improvements being adopted throughout DOD. Finally, we are making great efforts to inform and train our workforce. Our Acquisition Reform newsletter keeps our workforce up to date on the latest news, and our "Roadshows," modeled after a similar program in the Army, are providing training in the new acquisition environment.

Certainly, I can understand your concern that our reforms make a difference where it counts, but I can assure you that Acquisition Reform is happening from top to bottom. Reform is filtering down to the Air Force, and it is also bubbling up from the Air Force. I think we are already making a difference, although there is much more to do.

QUESTION SUBMITTED BY SENATOR CHARLES ROBB

FFRDC RESCISSIONS

Senator ROBB. Dr. Kaminski, as you know FFRDCs provide a unique service that few other analytic organizations can offer. Their value is most apparent during times of international change, where the DOD must utilize its internal and external analytic resources extensively to plan for uncertainty. What fact do you think the FFRDC rescission in the Defense Supplemental will have on DOD planning in general and on FFRDCs in particular?

Dr. KAMINSKI. At times of change and uncertainty, the analytic capabilities which the Department can draw upon are extremely vital to the formulation of our future strategy and resource management objectives. Draconian cuts to these capabilities hurt the Department in ways disproportionate to the actual dollars themselves. Because the Congress provided flexibility in implementing the defense rescissions, I believe the Department will be able to implement the cuts mandated by the defense rescission bill without doing grave damage to the FFRDCs. If the full $150 million were to be taken from the FFRDCs at this late date in the year, it would result in massive disruptions to vital ongoing research programs, layoffs at the affected FFRDCs, and the loss of vital work the Department is counting on for the current fiscal year and capabilities in the years to come.

[Whereupon, at 4:50 p.m., the hearing was adjourned.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1996 AND THE FUTURE YEARS DEFENSE PROGRAM

TUESDAY, MARCH 28, 1995

U.S. SENATE,
SUBCOMMITTEE ON ACQUISITION AND TECHNOLOGY,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

DEFENSE TECHNOLOGY AND INDUSTRIAL BASE POLICY

The subcommittee met, pursuant to notice, at 2 p.m. in room SR-232A, Russell Senate Office Building, Senator Dirk Kempthorne presiding.

Committee members present: Senators Kempthorne and Bingaman.

Committee staff members present: Richard L. Reynard, staff director; Christine K. Cimko, press secretary.

Professional staff members present: Jonathan L. Etherton.

Minority staff members present: John W. Douglass, professional staff member.

Staff assistants present: Pamela L. Farrell and Jason A. Rossbach.

Committee members' assistants present: Glen E. Tait, assistant to Senator Kempthorne; Thomas L. Lankford, assistant to Senator Smith; Richard W. Fieldhouse, assistant to Senator Levin; Edward McGaffigan, Jr., assistant to Senator Bingaman; John P. Stevens, assistant to Senator Glenn; William Owens, assistant to Senator Robb.

OPENING STATEMENT OF SENATOR DIRK KEMPTHORNE, PRESIDING

Senator KEMPTHORNE. In order to start this hearing as scheduled at 2 o'clock, I will go ahead and convene this hearing. Senator Bingaman should be here any moment, who, is the ranking minority member of the committee.

This afternoon, the Senate Armed Services Subcommittee on Acquisition and Technology meets to review a number of issues concerning the preservation of a viable defense technology and industrial base.

I will note that Senator Smith, who is the chairman of the subcommittee, was scheduled to convene this hearing. Unfortunately, he has been called away to New Hampshire for a funeral of someone who is very close to his family, so we certainly give our sincerest regards to Senator Smith at the loss that he is feeling at this time. I was happy to accept his request that I chair this subcommittee for him.

We will begin with testimony this morning from Mr. Joshua Gotbaum, who is the Assistant Secretary of Defense for Economic Security. After Mr. Gotbaum's presentation, we will hear from a panel of distinguished witnesses from the defense industry, Mr. Thomas Rabaut, President and CEO of United Defense; Mr. Don Fuqua, President of the Aerospace Industries Association, and Mr. Jacques Gansler, the Senior Vice President of The Analytic Sciences Corporation.

Our witnesses are in an excellent position to address the interrelated actions we must consider in taking a more active role in shaping the structure of the defense technology and industrial base. The first is to establish a sound basis for assessment and long-term planning. In 1992, Congress passed a comprehensive, detailed set of statutes requiring the Department of Defense, in the context of an interagency process, to conduct detailed assessments of the technology and industrial sector supporting national defense. These statutes, in Chapter 148 of Title X of the United States Code, also require the preparation of an annual plan to ensure that programs in the Federal budget support the continuing viability of the industrial base. Since these requirements were enacted, Congress has yet to receive a single timely report showing that the Department of Defense has made any serious effort to fulfill the assessment and planning requirements in Chapter 148. This neglect reflects a long-standing problem spanning more than one administration. We are encouraged by the commitment of Mr. Gotbaum to begin addressing technology and industrial base issues in the context of the Defense Department budget process. We must find a way to extend and incorporate those considerations into the congressional budget process as well.

Today, the Department of Defense is proposing substantial amendments to the industrial base assessment and planning requirements in Chapter 148. We have not studied them in detail but a preliminary review suggests that the analysis we received may be inadequate to ensure an understanding of the impact of our budget decisions on the industrial base.

The administration proposal will serve as a useful starting point for further discussions. No less important is the question of how to take greater advantage of the technology and the manufacturing capacity in the commercial sector. Time is running out. The defense-unique industrial base is shrinking dramatically. In areas such as information systems, microelectronics and telecommunications, the commercial sector is primarily responsible for the latest breakthroughs in technology and applications. We must continue the process begun last year in the Federal Acquisition Streamlining Act of breaking down the barriers for commercial companies selling to the military.

Finally, as we grow increasingly dependent on exports to preserve our production capacity in the near-term, we must work more closely with industry to ensure that our companies compete in the international marketplace on a level playing field. I will continue to support the creation of a loan guarantee program for defense exports similar to what our industry's foreign competitors are able to provide.

The witnesses today represent a number of different points of view. They bring years of solid achievement and experience in government and industry. Their testimony and the discussion that follows, I believe, will significantly advance our understanding of these vital issues as we consider specific actions for the markup of the defense authorization bill.

With that, Mr. Secretary, I welcome you to this hearing and will add that on all of the occasions that I have had the opportunity to meet with you, I have thoroughly enjoyed our discussions and I appreciate your abilities. So, with that——

STATEMENT OF JOSHUA GOTBAUM, ASSISTANT SECRETARY OF DEFENSE FOR ECONOMIC SECURITY

Mr. **GOTBAUM.** Mr. Chairman, you are both politic and kind, sir.

Senator **KEMPTHORNE.** Just being sincere.

Mr. **GOTBAUM.** Mr. Chairman, with your permission, having submitted a written statement, if I may submit the full statement for the record and talk through each of the points in a more summary fashion, I think I could make this condensed because there are parts of this testimony which I have included for purposes of completeness.

Senator **KEMPTHORNE.** Is there objection? [Laughter.]

You see, we might get a lot done this afternoon. [Laughter.]

Mr. **GOTBAUM.** I think, sir, that what I should do is talk very fast and open up for questions.

Senator **KEMPTHORNE.** In fact, Mr. Secretary, and all witnesses, we do have your formal statements, so to the extent that you would like to just summarize and get right to the thrust of this, it would be appreciated. Your formal remarks will be made part of the record.

Mr. **GOTBAUM.** Thank you very much, Mr. Chairman. If I can characterize our review, sir, it is that the issues of industrial capabilities and technological capabilities for defense are essential and important and it is also the case that the Congress, perhaps in advance of the Department of Defense and perhaps in advance of this administration, recognized the importance of these issues.

What I hope to explain today is really two things, sir. One is that we are paying attention, seriously, aggressively, on a broad range of issues; and two, that taking that into account, Congress should consider favorably modifying its requirements to us on Chapter 148.

But let me first talk about the issue and what we are doing about it. This committee knows, better than any other, obviously, that the world has changed for defense, that the threat has changed, that our budget has changed, that particularly in our procurement and R&D accounts there has been a reduction that is quite substantial, in fact more substantial than for defense as a whole. As a result, we have less with which we must do more because there is greater and more frequent deployment and we are in need of, even more than before, as our troop strength declines, the technological edge on which we have always relied.

Given the reduction in the defense budget, it is not surprising that defense capabilities are at risk. We are buying, if you look at the middle of the eighties to the middle of the nineties, the procurement accounts are down in real terms by over two-thirds, about 70 percent, depending on how you do your inflation. That is a huge reduction.

As a result, you might expect, some companies are exiting the business, some companies are saying we have other things to do with our resources, et cetera. Other companies, I will tell you in the defense industry, have adapted every structure. They have cut their overhead. They have consolidated their operations. They have made themselves more efficient in the way that we in the Department of Defense must and, I believe I am able to say, are beginning to do as well.

When you look at the defense industry, several things hit you. One is that revenues are down dramatically. Two is the profitability, on average and for most companies, in fact, has been maintained. This is the result of two things. One is that the defense industry has, in fact, taken the hard judgments to restructure itself to maintain profitability even as revenues decline.

The other is the way that we procure does in fact provide funding even at relative low levels of production. But the fact is that the world has changed, and we know it, and the Department has, in recent years, taken a series of efforts to recognize this change and change the way we do business and the way we support industry.

I want to tick them off. I am happy to discuss them in more detail in response to questions. First of all, promoting industry restructuring, promoting a more efficient defense industry.

It was argued persuasively that the Department of Defense had been reluctant to enter into the fray as the industry restructured, that the Department of Defense was unwilling to say, When two of our suppliers combine is this in our interest, is it in the taxpayer's interest or not?

In 1993, the Deputy Secretary of Defense convened a panel of the Defense Science Board and asked the panel, How should the Department of Defense interact with industry as it consolidates? The DSB suggested several things.

They suggested, first of all, that the Department ought to take positions. Second, before it does that, it ought to analyze and develop information about mergers and consolidations and it ought to review those mergers and consolidations in the context of us as a customer and on behalf of the taxpayers because what we find is that consolidation has a blessing and a curse.

The blessing is because we pay for the overhead when two companies combine. If you have two companies, each of which is working at one-third of capacity, we are paying for all that excess capacity, excuse me, "we" are, the taxpayers are.

So, if they combine and consolidate, there is a saving to the taxpayer but obviously, there is also a corresponding risk and so what we have begun to do, in case-by-case, and Lockheed and Martin Marietta are only the most visible example of that, I want to be clear to point out, is when there are major consolidations to come to a judgment within the Department and say, Is this in our interest as customers? Is this in the interest of the taxpayers? And then to work with the antitrust agencies and make sure they understand our views.

Sometimes they will agree, sometimes they will not agree, but we want to be aggressive and make it clear that we are willing to facilitate restructuring.

Another thing that we do when it is to our benefit, is to pay for restructuring costs. If those two companies that I mentioned with excess capacity are combining into one plant, thereby saving the taxpayers some money and we get the savings, it is, in our view, necessary for us to pay our fair share of the moving costs, the severance costs, et cetera, involved. What we have begun to do is to say we will do so where it is helpful to the Department and the taxpayers.

Again, the change in emphasis, change in policy, it has been codified in Chapter 818 of last year's Defense authorization bill, but it is another example of, again, where we are trying to encourage restructuring that is helpful to the Department of Defense.

Another area which is, in our view, necessary, although more controversial, is in foreign acquisitions. We have just completed a review of the proposed acquisition by Rolls Royce of England of Allison Engine and the reason for doing that was very simple. We have technology that is potentially at risk there.

It is important that we make sure the technology transfers are adequate but it is also important to us that there be competitive juice within the systems that provide help to us because, and this gets to the second real change in policy, increasingly, we in the Department of Defense, as this committee knows very well, are dependent on both the traditional defense sectors and broader commercial sectors. What we have had to do is recognize this in our R&D practices, in our procurement practices, in our specifications, et cetera, case after case after case that we need to rely more broadly on a broader base of suppliers, one; two, that if we do, in may cases we are getting access to technologies we otherwise would not get.

The Department of Defense funded the development of computers, funded the development of semi-conductors, but nowadays, most research is in fact done by people in the commercial sector and therefore we need to adapt and change the way we do business to take advantage of it.

We are doing so. The most visible portion of that is obviously acquisition reform which is an attempt to be clear, for us to be able to acquire as much as possible, like commercial businesses, so that we can, in fact, acquire from a range of commercial businesses.

The same is true in dual use technology and in our various dual use technology programs, which I can talk about if it is of interest.

The other implication which comes from the fact that the world has changed and the economy has changed, and the fact that we are dual use, is that we increasingly have to deal with international issues.

These take several faces. One is the one of international acquisitions, which I have already discussed, where we are, again, trying to be more aggressive, more careful, more articulated as to what our policies are.

Another is the area of international cooperation. As we spend more time deploying on a joint basis, it becomes more and more important that our systems be interoperable. As our budget goes down, it becomes more and more important that somebody else share the load.

As a result, we have renewed our efforts to try to develop weapon systems on a cooperative basis. This is frankly extremely difficult because different nations have different objectives, they have different industrial bases, they have different systems and procurement systems, et cetera, but we think it is important and we are being considerably more aggressive in it in the current context than we have been in the past.

The last area which I think is important, and which is obviously the primary subject of the committee's inquiry, is preserving essential capabilities. Dual use, commercial military integration, is a fact. You can say whether it is a good thing or a bad thing but it is a fact. But, it is also a fact that a lot of the capabilities we need, a lot of the support we need, is in fact defense-unique and will remain defense-unique.

It is also a fact that as our defense budget goes down, there are capabilities, we believe, that are at least apparently at risk. One of the things that is true and this committee has noted it in the past, is that the Department of Defense has not been particularly consistent or transparent in its ways of dealing with these capabilities at risk.

I think it is part of the basis for passing Chapter 148 in the first place, and I will tell you personally it is one of the issues that I was brought into the Department to address and I believe we are beginning to do so.

How? First of all, by saying, What has our practice been? What kind of guidelines make sense? So that Army, Navy, Air Force, wherever there is a capability at risk we have a relatively consistent set of procedures.

So, we set out a set of guidelines to do just that—this was a few months after I was confirmed—we pulled together the service acquisition execs and they said, "This is great, this is policy, this is a consistent approach for the Department in industrial base areas." So, I said to them, I am new to the Department of Defense, would you field test this, please.

So, they all did and for 3 months, they applied our rough guidelines to a series of weapon systems and to decisions about industrial base. They came back 3 months later and said, "This is terrific, this is great, this is policy, et cetera, and it permits us to do exactly what we were doing before."

As a result, we figured out the guidelines were not enough and so what we are doing now is we are trying to develop more detailed guidance, a handbook, if you will, as to how we ought to deal with industrial base concerns. When you have a problem, what questions do you ask, et cetera. So, we are trying to ask these questions more consistently in the handbook.

We are doing a set industry sector assessments and we are doing these partly as a learning and partly as a teaching tool for the Department of Defense because what we are doing in each of these cases is we are taking an industry where we believe there to be some problem or where it is reported there is some problem, and saying, Let us work together as a Department, the various services and OSD, and go through and see if we can develop a consistent methodology, see if we can develop some set of conclusions as to whether there is a problem, how big a problem it is and what kind of policies make sense.

We have been doing this in an area—and some of these are in reports that have already been furnished to the committee—areas like conventional ammunition, space launch. We are working on some now on helicopters and tracked vehicles. We are also working in a similar vein in some technology areas for the same reason, to try to develop some consistency, to try to flesh out issues.

I know I furnished a list of this. I think it is important for the committee to know that the list that we submitted in our industrial base report that we sent to the committee last fall is not exhaustive. For example, in response concerns on the part of the Congress about the bomber industrial base, we have, in fact, responded by saying, In this area, too, let us see what capabilities really matter, and we are working on that basis.

So, guidelines, studies, the third point is consultation with industry. We take the view, I personally take the view and I know this is shared by the Secretary of Defense, the Deputy Secretary of Defense and the Under Secretary of Defense, that if you are concerned about the health of your supplier base, you have to deal with your suppliers.

As a result, we have tried very consistently, both in the design of the studies we do and we will in the discussion of the guidelines we propose, have discussions, consultations, get reactions with a very broad range of industry groups, some of whom are sitting in this room.

The last point which I should mention before I get directly to Chapter 148 is we are mindful of the fact that studies take energy, studies take time, studies represent a use of resources, both on the Department of Defense and on our suppliers.

Senator KEMPTHORNE. Mr. Secretary, if I may interrupt you, there is a vote on the floor. I am going to have to go over and cast a vote. I was planning to go ahead and proceed, but I know that Senator Bingaman will be able to join us after the vote and he would like to hear the next part of your discussion, so why do we not recess for about 10 minutes. I will be right back, and we will continue. Thank you.

[Whereupon, a brief recess was taken from 2:19 p.m. to 2:32 p.m.]

Senator KEMPTHORNE. Ladies and gentlemen, I will reconvene this hearing. I would like to note that Senator Bingaman has joined us and I certainly extend a welcome to him. As you know, Senator Bingaman, during the 103rd session, was the chairman of this committee. His leadership on these issues is well known and regarded and I would note, too, Senator Bingaman, that the courtesy and the fairness which you always extended to members of my party while you were chairman was greatly appreciated and I think serves as a good role model for us as we now take the gavel. So, I appreciate your being here and your leadership.

With that, Secretary Gotbaum, if you would like to proceed.

Mr. GOTBAUM. Mr. Chairman, forgive me, if it is not inappropriate, I would at least like to lead in by noting for Senator Bingaman that what I covered before and what is in the prepared testimony is essentially the range of actions and initiatives that we have taken, essentially in recognition of what you already know, which is that we have to change the way we do business to take into account the fact that the budget has declined, that industry is consolidating, that we need to rely on the commercial sector far more.

One—and I mentioned the fact that we were spending time trying to be more consistent in our programs and we had spent considerably more effort consulting with industry and one I was going to mention, because it is one I am actually quite proud of, is that we have gone through and essentially reviewed the way we gather information from industry to worry about industrial and technology base issues because studies have consequences, studies require resources.

Studies require people in the Department of Defense to pay attention, gather information on our suppliers. As a result, some of my colleagues, some of them are here, last year pulled together the Army, the Navy, the Air Force and OSD and said, By the way, how do you gather information? What forms do you use, et cetera.

What we discovered is we had four separate forms asking industrial-base questions. We had two for all of DOD, we had one in the Navy and one in the Air Force. They then got together and worked continuously for a period of about 6 months and said, We ought to try to develop some consistent method of asking for this information, a single questionnaire.

I am pleased to be able to report that we are going to replace four separate questionnaires, some of which are sent in duplication to our suppliers to ask information and which, of course, all have to be read, with a single questionnaire, which I am sad to report is still in review by the Office of Management and Budget.

But I hope within the next several months that, again, we will develop a consistent, more efficient approach, and then apply it and we are going to then do an after the fact testing. After we have had this questionnaire out for a year we are going to go back and say, Okay, how does it work. Are we asking the right information. et cetera.

My last point before getting to Chapter 148 is that the whole purpose of this, we believe, is to integrate these concerns and to program budget and other decisions on the Department of Defense. That is why we are here.

That brings me to Chapter 148. It is crystal clear that the Department of Defense, not only in this administration, has failed to comply with the requirements of Chapter 148. It is very clear to us that the purposes of Chapter 148, the concerns of Chapter 148, worrying about the health of your industrial and technology base, are essential.

As I hope the testimony makes clear, as I hope the record makes clear and frankly, you can ask the folks on the next panel, we are moving out. We got the message. We are working on it.

We do, however, feel that the procedures that are outlined in Chapter 148 ought to be reformed. Frankly, when I first read the law I thought it was understandable. You have a Department of

Defense that has refused to be responsive after a period of time and it is not surprising that you might get legislation that says, Okay, you must do this and do this and do this, et cetera.

But the result is, right now, that we are required to do a set of analyses that I would characterize as comprehensive, in other words, each sector and top down. Our view is that this has two problems. One is that we found the comprehensive, top down kind of analyses, no matter how well intentioned, take a lot of effort and very rarely get you to the actual, real problems because what we find is that industrial base problems are individual cases.

Industrial base problems are where a third tier supplier of one of our primes says, I may not be here because your production levels are too low. Industrial base problems are where some domestic supplier is the last guy and a program manager has to say, Should I do this or should I consider foreign sources.

Industrial base problems are where the Department of Defense and the antitrust agencies are trying to consider whether or not it is a competitive problem for us if we are down to a single supplier. But the point is, they are very much individual cases. They are not cases very much which lend themselves to a top down, comprehensive approach and because Chapter 148 is written so broadly, because it requires comprehensive assessments and then comprehensive plans, it is—well, I cannot say it is taking away resources that would otherwise be applied because, as you know, we have failed to comply with it.

But if we were, if this Congress says, We are not going to change it, we are not going to change the law, you must stick with it, I will tell you that it will require substantial resources to comply with the letter of Chapter 148 and we will fail to comply with its spirit because in order to comply with its spirit, we think the best approach is in fact the bottoms-up approach.

It is an approach that says, when you think you have got a problem, that is when you do a study. When you have got a supplier that says, I am in trouble, that is when you go. We have done things like that.

For example, in the convention ammunition area. The Army has said, We think we have a problem with conventional ammo. We said, Fine, let us work with you to review it. What we did is we did a screen, 102 companies in the industry that might have been concerned, sent a limited screening questionnaire to all of them.

Those that did not answer, we said, okay, they are probably not hurting enough to worry. Those that did answer, we said, Okay, which of those, on a projection basis, look like they might not be profitable, which of those are a capability which the Army says they need, and then focus attention on those. That is what we are doing on conventional ammo.

So, it is this bottoms-up approach, problem by problem approach, which we think will get the result that the Congress intended and that we share in terms of paying attention to industrial base.

As a result, we have proposed, it is a proposal that is a modification of Chapter 148—and if I may, I would like to tick off the main points and then take whatever questions in whatever form you would like.

First of all, we would make the Secretary of Defense responsible for issuing policy guidance in this area. We would make the Department the responsible official and the Secretary responsible for issuing guidance, developing procedures, in effect, setting the standards which would be implemented on a bottoms-up basis by the services subject to OSD review and to review by the Congress in the form of follow-on reports.

Let me talk about what the change is. Right now Chapter 148 says there will be an interagency committee, the National Technology and Industrial Base Council, which committee has never met, which should perform comprehensive assessments and then develop a plan for dealing with these sectors.

I should be very clear to this committee because it is very important to us, this is a dual use world and we do in fact consult with other agencies in developing research priorities. We consult routinely, for example, with the Department of Commerce and the Department of Energy in figuring out where it makes sense to allocate R&D. But we do not think an interagency committee structure makes sense because that is even more top-down than simply the Secretary of Defense to deal with industrial base problems. We think that ought to be bottoms-up.

So, we would propose to make the Secretary of Defense the responsible official, say he must promulgate regulations and guidance as to how to do it, that there ought to be implementation, service level on a decentralized level, and then there ought to be reporting back—reporting back to the office of the Secretary of Defense as to what people did, what decisions they made, what analyses they did, to justify it, and then reporting to you, the Congress.

What we would hope the result would be is that each year we would come back, having already integrated industrial base concerns into budget decisions and say to this committee and the Congress, from the defense budget, here are the actions that were taken on a defense industrial base basis, here are the reasons why and here are the dollar amounts attached, so that there would accountability as to when these decisions get made.

Those really are the kinds of changes in the legislation we have proposed. I do not want to over-gild the lily. I believe these issues are incredibly important. I also believe the record is very clear that this administration and this Department is working very hard to achieve them and what we hope the committee and the Congress would entertain is a modification in Chapter 148 sufficiently to let us focus our resources where we believe they can be most effective, which is setting guidance and reviewing the actions of individual program managers and individual programs.

With that, Mr. Chairman, Senator Bingaman, I would be happy to answer any questions that the committee might have.

[The prepared statement of Mr. Gotbaum follows:]

PREPARED STATEMENT BY JOSHUA GOTBAUM, ASSISTANT SECRETARY OF DEFENSE FOR ECONOMIC SECURITY

Good morning. Mr. Chairman, members of the committee, I appreciate the opportunity to talk to you today about the efforts we have underway in the Department of Defense to identify and preserve industrial capabilities that are essential to our Nation's defense.

As this committee knows only too well, the Department is committed to providing our troops with the most advanced and effective equipment in the world and to maintaining their technological superiority in the battlefields of the future. To meet these requirements in a period of rapid technological change and declining defense budgets requires changes in the way we do business. First, we must broaden the range of our suppliers to draw on the best technology available. Second, we must ensure that we continue to have access to essential defense-unique design and production capabilities. To do so, we must develop a consistent methodology for identifying those capabilities.

Today, I'd like to review the significant changes in our environment, discuss our response to these changes, and finally, offer some revisions to make our current reporting requirements consistent with these efforts.

A CHANGED WORLD

As we all know, the world has changed dramatically over the last several years. We've won the Cold War, and no longer are preparing for global war. Instead, we are preparing to fight and win smaller, regional conflicts, carried out in varied terrain, often in cooperation with our allies. These changes have had a considerable impact on those of us involved in defense.

First, declining requirements and budgets are resulting in fewer purchases of defense-unique products. Between 1985 and 1995, our procurement accounts will have fallen by more than 60 percent from over $100 billion to $45 billion. The defense-unique base on which the United States has historically relied is undergoing profound changes. The defense industry is restructuring and consolidating. Some companies have left the industry entirely.

Second, in many areas that drive the leading edge in military systems, DOD is no longer in the lead. The greatest technological advances are taking place in the commercial sector. For example, commercial industry leads in information systems, telecommunications, and microelectronics—all of which are vital for meeting the needs of a modern military force. The bulk of the research and development money is now spent in the commercial sector. For instance, in 1965, both DOD and the commercial industrial sector spent approximately the same amount on R&D. By 1990, the industrial sector outspent DOD by nearly two-to-one.

Third, as we now know well, we are living in an increasingly global economy. Imports and exports of goods and services make up nearly 25 percent of our GNP today compared to just 10 percent a few decades ago. Not surprisingly, in some areas, foreign firms are developing technologies which would benefit us.

As I will describe today, the Department is putting in place the policies and strategies to respond to these changes—and to ensure that we have the industrial and technological capabilities we need to meet current and projected national security requirements.

PROMOTING A MORE EFFICIENT DEFENSE INDUSTRY

First, the Department of Defense is taking a more active role in assessing the changes underway in the defense industry. Although reductions in the defense budget have sharply reduced defense industry sales, defense contractors have generally remained profitable. They have maintained their profitability in part by restructuring and consolidating. They have reduced the size of factories to match lower demand, closed some that are no longer needed, and merged divisions and operations. Recent consolidations, such as that between Lockheed and Martin Marietta, are evidence of the industry's push to consolidate. This type of restructuring, of course, is not new, nor is it unique to defense. In recent years, dozens of major companies have taken these steps.

The Department welcomes the rationalization of our suppliers. Since excess capacity in defense firms translates into higher weapons costs, rationalization generally brings a clear cost savings to the Department and to the U.S. taxpayer. However, consolidation also entails risks which DOD must consider. In particular, we have a clear interest in guarding against the loss of competitive pressure, efficiency, quality, and critical technologies. Accordingly, the Department has become more active in antitrust reviews of defense industry mergers.

In 1993, we chartered a task force to consider and make recommendations on antitrust concerns. The task force concluded that the Department should do a better job in communicating its views and knowledge about the defense industry to the antitrust authorities at the Department of Justice or the Federal Trade Commission. In response, we developed procedures that allow us, as we did during the government review of the Lockheed-Martin Marietta merger, to evaluate the costs and benefits of specific mergers and to provide this information to Justice and the FTC.

The Department realizes that, in order to achieve savings through consolidation and restructuring, we may have to share in restructuring costs. DOD has established procedures to allow such costs if they will produce savings for defense and the US taxpayer as required by legislation. If the Department does not share in restructuring costs, it will discourage firms from undertaking restructuring efforts at all, which would ultimately result in higher costs to DOD. It makes economic sense to consider sharing the short-term costs to realize long-term savings.

PROMOTING COMMERCIAL-MILITARY INTEGRATION

Second, we are seeking to promote greater integration of the commercial and military industrial sectors. The Department understands it can no longer afford to rely on a defense unique industrial base. By drawing on the capabilities of the commercial sector, we can both reduce the costs and improve the performance of defense systems.

To achieve this objective, we have made acquisition reform not just a slogan, but a priority. We are moving as quickly as possible to eliminate DOD-unique product or process specifications and standards that inhibit the purchase of commercial products or services, or dictate to a contractor how to design or produce a product or service. In fact, we are reviewing every military spec and standard to determine whether it is necessary, can be replaced by a commercial standard or by none at all.

Dual-Use technology is another essential element. Just last month, the administration released the dual-use technology strategy which outlined the benefits and goals of increased dual use. Let me quickly summarize some of the advantages:

- Shortens weapon system development time by inserting commercial technology into defense systems.
- Reduces costs for procuring leading-edge technology by integrating defense and commercial production.
- Increases the pace of technological improvement by tapping into, and contributing to, commercial research and development.

The fact of the matter is, that with the bulk of R&D being spent in the commercial sector, coupled with our decreased budgets, the use of commercial products and processes is both desirable and inevitable.

TAKING ADVANTAGE OF INTERNATIONAL OPPORTUNITIES

Third, we are renewing our efforts at international cooperation. There are several facets to this approach. International cooperative development programs are clearly at the forefront. International programs encourage the development of interoperable systems and help stretch defense dollars. Some successful examples include the F–16 Falcon, AV–8 Harrier, T–45 training aircraft, CFM–56 engine, and the continuing cooperative efforts under the NATO AWACS program.

We can also reduce our costs, where appropriate, by drawing on foreign suppliers and supporting exports from U.S. manufacturers. The United States has always considered arms exports primarily as a foreign policy and national security matter. The new conventional arms transfer policy does not change this emphasis. It continues to place primary emphasis on foreign policy and national security matters in determining whether to approve a particular arms export. It does, however, consider the contributions that arms sales can make to the maintenance of our defense industry. Still, we must ensure that we do not become dependent on arms exports to maintain defense capabilities. Exports are too volatile to be counted on as a primary supporter of essential capabilities.

PRESERVING ESSENTIAL CAPABILITIES

Fourth, we will take steps when necessary to preserve essential defense-unique capabilities. Although the benefits of commercial-military integration are far-reaching, there are certain capabilities that will remain defense-unique. They have no commercial counterparts and depend on defense markets for survival. As the procurement budget shrinks, we must be able to identify and, if necessary, preserve such essential capabilities. However, we neither can, nor should, attempt to preserve all capabilities—only those that are both truly essential and truly at risk.

I think it's important to emphasize, here, the distinction between companies and capabilities. The Department's goal is to preserve essential capabilities. It's not our job to preserve a particular level of company profitability, nor particular production levels, nor even a particular company. In many cases, we expect industries to consolidate and firms to merge. And in many cases; that consolidation is necessary and desirable. It reduces excess capacity for which we otherwise would pay and improves the prospects for the industry as a whole.

IMPROVING DOD'S INDUSTRIAL DECISIONMAKING

In the past, judgments by the Department and the services to preserve a particular firm or capability were done on an ad-hoc basis. There was no consistent methodology or analysis. As a result, many of these actions seemed—and were—inconsistent. In part this reflected a belief on the part of previous administrations that such activities constituted "meddling in the marketplace."

We believe that we cannot afford to ignore the changes underway in our supplier base. We must develop the methods and policies necessary to make informed judgments—about when we need to act and when we don't. Accurate, relevant and consistent industrial assessments are vital, and we have taken steps to obtain them.

Our approach is to provide the tools to the services and their program offices to make appropriate judgments about industrial issues—and to integrate those judgments into the regular budget and acquisition process.

MAKING CONSISTENT JUDGMENTS

We began the process of making DOD's industrial decisionmaking more consistent shortly after I was confirmed last summer. We developed a short set of guidelines that specified the conditions under which the Department would—and would not—take steps to preserve an industrial capability. We then asked the Military Departments to test these guidelines in the field—at their program offices and buying commands. Their responses indicated that short guidelines were not sufficient to promote consistency in our industrial decisionmaking. The Service representatives then asked for greater guidance.

In response, we not only modified our guidelines, but began developing a handbook that explained how to use them. The handbook provides criteria for, and examples of, how to identify and maintain industrial capabilities that are both essential to defense and "at risk". The assessment handbook lays out DOD's step-by-step industrial capability analysis process to answer three basic questions.

- What industrial capabilities are essential to making the products DOD needs?
- Are these capabilities truly endangered?
- What is the best course of action for DOD?

The handbook details the steps DOD managers should take to answer these questions. Typically, an industrial base issue arises because DOD has stopped, or is about to stop, buying something. The first step is to verify the national security requirement. What is the national security requirement for the product or service? For example, does it meet a current requirement or is it a technology that is necessary for the development of some future system? Who else uses the product or services? The objective is to determine whether the product or service that seems to be at risk is in fact vital to meeting current and planned national security requirements, and to determine the scope of the defense and commercial market.

Second, we show the manager how to validate the risk to the capability. Will a supplier in fact go out of business if we buy at lower rates? Will the capability be lost if the current supplier is lost? The financial analysis required by this section is important and new to the Department. The objective of this section is to determine whether the capability is truly at risk.

Once the manager has determined a needed capability is truly endangered, the third step in the process is to identify and analyze the alternatives. In most cases the Department has choices: Should we continue purchases at a maintenance rate? Should we instead purchase the technical data sets and/or "mothball" the facilities? Should we support research into the next generation of technology instead of maintaining production of the current models? Should we turn to substitute or foreign sources? Each of these may be possible, and if feasible should be considered on a cost-benefit basis. To assist the manager, the handbook lays out many possible alternatives and how to analyze them.

We expect to issue the handbook in draft form this spring. After we have tested it again with Services and received comments from industry and others, we will publish it formally with accompanying directives.

We hope that, in the end, judgments about how best to preserve particular capabilities will be made as much as possible on a decentralized basis by program managers who are familiar with the situation. The role of senior management, in the services and OSD, would be one of developing the policy and reviewing the result.

PERFORMING SELECTED SECTOR ASSESSMENTS

While we have been developing this bottom-up analytic approach, we have undertaken a selected number of sector assessments. These assessments address sectors in which we have reason to believe—due to budgetary reductions or impending acquisition decisions—that there may be some problem. In early 1994, we identified the following 5 sectors: conventional ammunition, space launch vehicles, helicopters, torpedoes, and tracked vehicles. We have since added two others—heavy bombers and Meals-Ready-to-Eat. We also initiated a number of technology studies, including semiconductors, advanced materials, commercial transport, and micro electromechanical systems.

We have completed several of these—conventional ammunition, flat-panel displays and space launch vehicles. We have found that these studies have helped us to refine our analytical methods, to develop common understanding across the Military departments, and to improve our handbook. In a few cases, they have also formed the basis for program and budget decisions.

We have provided these sector assessments to the Congress and to industry. We will continue to do so.

IMPROVING CONSULTATION WITH INDUSTRY

We are consulting closely with industry on both the methodology and the specifics of the assessments. The Defense Industry Base Task Force, which is composed of industry representatives, has made recommendations on the issue of depot maintenance and has helped us improve the way we intend to collect industrial facility information. In addition, the Defense Policy Advisory Committee on Trade has provided a forum for the exchange of information between industry and the Department. We have discussed our assessments, and will ask industry to review the handbook.

STREAMLINING INFORMATION COLLECTION

Although the Department has an increasing need for accurate industrial facilities-related information to support its analyses, it has not always identified and collected that information on a consistent basis. Multiple, sometimes duplicative, Department collection efforts have created an unnecessary burden on both private contractors and government organizations.

The Department is correcting this problem. Representatives of all the Services and the Defense Logistics Agency identified, consolidated, and integrated their recurring industrial facilities-related information requirements for the post-Cold War era. The new information collection process replaces four separate DOD information collections. Once approved by the Office of Management and Budget, it will be adopted by all the services and the Defense Logistics Agency. The information will then be made available Department-wide for industrial capabilities analyses that:

- Enable decisions facilitating cost effective acquisition of systems and items programmed in the Future Years Defense Program.
- Examine the implications of reductions in defense spending.
- Evaluate requirements and options associated with accelerating production to meet contingency and replenishment requirements.

The new information collection requires the Department to develop annually an integrated data collection plan in which all recurring industrial capabilities information requirements are identified and consolidated. The burden on defense contractors associated with providing the information to the government will be minimized by:

- Consolidating Department-wide information requirements for individual firms.
- Identifying only the minimum information necessary from those firms.
- Exhausting Department information sources before requesting contractor inputs.
- Assigning a single Department representative to contact the selected firm, when contact is necessary.

The Department has solicited industry comments on the new data collection's utility, clarity, and complexity. All significant industry suggestions were adopted.

After 1 year, the Department will review the data collection process, and the extent to which collected information is used to make effective decisions. The review objective will be to ensure the Department is performing its duties in an efficient and effective manner—and one that creates the least burden on industry.

INTEGRATE INDUSTRIAL CAPABILITY CONCERNS INTO DOD'S DECISION PROCESSES

The process I have just described is not assessment for assessment sake. We are systematically integrating these assessments into the Department's existing budget and acquisition processes. In the past, such analysis was done on an ad-hoc basis. No longer. We have taken steps to ensure that industrial assessments are an essential part of our everyday decision making. With improved data access, and a common method of analysis, the Department can make more informed budget decisions, and recognize essential industrial capabilities which need to be preserved. By achieving this, we believe we will keep our military the strongest in the world and ensure that it continues to be well-prepared to meet the evolving threats of the post Cold War era.

REFORMING CHAPTER 148

The Congress recognized years ago that the changes in the threat and in our budget meant that there must also be changes in the way the Department does business. Apparently, in previous administrations, the Department was slow to respond. Congress then passed Chapter 148 to force the Department to pay attention to these industrial and technology issues.

We are getting the message. As I hope this testimony makes clear, this administration and this Department recognize that the world has changed and that we must change with it. As both industry and our budget downsize, we need to conduct the necessary analysis to identify capabilities at risk, and to do so on a consistent basis. And as I've just described, the Department has begun a coordinated effort to identify and analyze industrial concerns, and ensure technology and industrial issues are effectively integrated into its existing review and decision processes. We strongly support the fundamental judgments that underlay Chapter 148 and are busy implementing them.

The procedures of Chapter 148, however, are another matter. As enacted, Chapter 148 requires the Department of Defense and the entire Administration to make detailed assessments and comprehensive plans for vast sectors of the economy. Specifically, it requires a detailed assessment—including an in-depth financial analysis—of every defense sector and then requires a detailed plan for the entire industrial base. In today's dual-use world, the "defense industrial base" is an extremely expansive term, and includes many of the bedrock industries of the entire economy: communications, computers, transportation and so forth. I believe it is neither desirable nor feasible for the Department of Defense to become the national planner for the U.S. economy.

It is for these reasons that Chapter 148 should be reformed. We believe this not only because complying with the current combination of assessments and national plans would require a vast bureaucracy and substantial new resources at a time when we are downsizing. More fundamentally; we believe Chapter 148 should be reformed because its top-down approach is inconsistent with the real industrial base problems we face every day.

The vast majority of real industrial base issues are individual cases: a third-tier parts supplier who thinks the lower volume doesn't justify keeping a line open; a program manager who is down to a sole domestic supplier of a particular part and unsure whether to consider foreign sources; a service that is trying to decide whether to substitute a requirement that only one or two suppliers can fill with a commercial one that could be supplied by many; the Department and the antitrust agencies who are faced with the combination of the only two remaining suppliers of a critical part. No industry-wide assessment or comprehensive plan will ever provide the basis for making these judgments. And, by forcing the Department to use its limited resources to comply with far-reaching industrial assessments, we may in fact lose the ability to respond to these fundamental problems.

Unfortunately, this is precisely the approach taken in Chapter 148. We believe that, as written, it is too rigid and wide in scope to serve either Congress or the Department's needs. The most effective way to ensure that DOD meets the objectives of Chapter 148 is to focus its requirements on the analyses and judgments necessary to make the Department's key budget, acquisition, and logistics decisions. We have submitted a draft of our proposal to this committee. I would like to summarize its key provisions:

First, our proposal requires the Secretary of Defense to be responsible for undertaking in the DOD budget the actions necessary to preserve essential industrial and technology capabilities. This does not mean that we intend to eliminate the interagency discussion that has enabled us, for example, to avoid duplication of research priorities in dual-use. It does mean, however, that the Department of Defense will be given the necessary flexibility to respond to the multitude of situations which may, and will, arise.

Second, our proposal requires the Secretary of Defense to develop appropriate guidance and directives—such as those outlined above—to achieve this goal. It also requires the Department to undertake selected industrial assessments, and eliminates the requirement to prepare comprehensive assessments of every sector. Furthermore, these assessments will not be academic exercises. They will be integrated into the Department's PPBS, acquisition and logistics decision-making processes.

Third, our proposal requires the Department to submit an annual report to Congress for the next 3 years. That report will describe DOD guidance, the analytical methodologies used, the assessments performed each year, and any actions and budget decisions taken for industrial capabilities reasons. We believe it is important that Congress is kept informed of the methods, and types of assessments undertaken, as we continue to improve the process of reviewing industrial capabilities. The annual report would be provided for that purpose.

We believe these changes would have two beneficial effects: It would focus our efforts on achieving the goals you set out in Chapter 148, and relieve us of obligations that ultimately distract us from doing so.

CONCLUSION

I believe we have made a fundamental improvement in the way the Department manages industrial capabilities in this period of significant defense industry downsizing. From our efforts to take advantage of commercial technologies and processes, to our enhanced methods of analysis, we are changing for the better. And, with your help, we will improve Chapter 148 to meet the Department's and Congress' needs more effectively.

I am confident the results of our efforts will be a robust technology and industrial base fully capable of meeting current and future national security requirements.

We appreciate your recognition of the importance of these matters, and thank you for considering our proposals. I look forward to working with this committee to implement our common goals, and would be pleased to answer any questions you may have.

Senator **KEMPTHORNE**. Mr. Secretary, thank you very much. I will ask the first set of questions and then we will just rotate back and forth here, so, if we could, 5 minutes, 6 minutes apiece would be appreciated.

Mr. Secretary, you referenced just a few moments ago the defense consolidation that is taking place in the private sector. What is the DOD position regarding defense industry consolidation and is there not a point at which prime contractor consolidation becomes a risk as much as a benefit, and also, how is DOD monitoring these mergers as it relates to industrial base capabilities?

Mr. **GOTBAUM**. Very important question, sir and I am pleased and relieved to be able to say we are paying attention. As I mentioned, and I am going to use Lockheed-Martin as an example, not because it is the only one but because it is so big that everybody knows about it.

There were clearly benefits from consolidation. We talked about those. We do not believe the defense industry consolidation is overserved because even though, we hope, that the Congress will in fact approve the increase in procurement accounts that we have proposed, it is still true that when you look at the difference between budget authority and budget outlays, we have got a couple of more years in which our outlays are actually going to fall.

So, the drop in revenues that the defense industry has had to deal with is not over. In fact, Secretary Kaminski estimates about a third of it is yet to happen. So, we think there will be continued consolidation. That will happen.

Then the question is, How do you pay attention to the risks. Again, what we do is by in a case-by-case basis, looking at what are the capabilities where you are in danger of going down to sole source and saying, What are the risks of going to sole source? What do I give up and what do I gain?

If I can actually use not a Lockheed-Martin Marietta case, I will give you a different case, in which we faced this issue and came to a judgment, a considered judgment, if you will, that we could afford the risk of getting down to a single supplier was when Martin Marietta proposed to buy General Dynamic Space Systems.

Martin Marietta makes the Titan IV, our highest and i.e., heaviest space launch vehicle, GD Space Systems makes the Atlas, the next one down, and there was very real concern within the Department, Are we therefore putting too many eggs in one basket?

So, what we did is we sat down within the Department, the Air Force, with various parts of the Air Force, and said, in effect, to them, guys, do you have other capabilities to provide this other than the combined Martin Marietta-GD Space Systems?

Senator KEMPTHORNE. Did you really say "guys" or did you say Generals?

Mr. GOTBAUM. Fair point. Actually, I believe I said "sir." But you are right. It was interesting because one of the—you are right, sir, it was of the three stars to whom we asked this question—said, You know, we really had not thought about that issue. So, we said, Well, it would seem to us that you should.

And so the Air Force, in fact, went through and spent—my time sense is lousy, but I am going to say 3 weeks or a month—and came back and said, We believe we are comfortable in this area because, first of all, launch vehicles are a derived demand for the product that we actually are pushing, which is the satellites, and we have control over the satellites so we can move them around within a range.

Second, that there are other potential competitors in this arena that could supply this if we thought that we were not getting adequate service from those. So, it is an issue that we worry about, no question.

It is an issue that we are worrying about increasingly and which we will worry about even more so as the industry consolidates but it is one we think you have to make a judgment on. There are not automatic answers on it and it is one to which I want to be very clear to this committee, we are paying attention.

Senator KEMPTHORNE. In your statement that you provided, you noted the need to preserve defense-unique industrial capabilities. How does the Department propose to identify these defense-unique capabilities, and also, how will defense-unique research and development capabilities be identified?

Mr. GOTBAUM. Let me deal with the question of defense-unique capabilities first. Actually, we did it in the first set of guidelines, the ones that were too vague to work but we are also doing it in the more detailed guidance that we are providing now.

We said, When you think you have an industrial base problem, one of the questions that you have to ask is, are there substitutes? Are there commercial alternatives or are there not? So, in effect, what we are saying is before you say I have got a problem, you have got to at least consider whether or not there is some commercial substitute.

But if there is not, then, you move to the next step in the chain which is, Okay, is this capability at risk and what should the Department of Defense do to protect that particular capability? So, what we have, in effect, done is we have made it part of the process, excuse me, we have designed it into the process we expect to implement. This is not a fact, as I say, this is policy on which we are working now, but essentially put into the design process.

With regard to the R&D area, the way we make R&D decisions, and I am hardly the expert here but I will tell you what I know, that Anita Jones, or Paul Kaminski, or John Deutch would say is, We are mindful in our R&D budget that when it comes to defense-unique technologies, we are the whole show, so we, in making judgments about the kinds of technologies we need and the kinds of priorities we need, consciously pay extra attention to those where we think there is not a commercial source of R&D funds, a commercial source of product.

Now, that is not the whole answer because there are a lot of times in which what we are looking for is essentially a DOD modification. So, what we say is, We will do part of the research if we get part of the product.

But, in general, we do it by paying attention and recognizing that where we are the only game in town and it is even more important how we play the game.

Senator KEMPTHORNE. My time has expired. If I may then, to conclude, I am going to go back to that first question when I asked what the DOD position regarding defense industry consolidation is. If I hear you correctly, you are saying it depends on the situation, there is not a hard, fast position by DOD?

Mr. GOTBAUM. Sorry. The DOD position about whether there will be defense consolidation is we expect it and we expect there to be more of it. As to whether we will think that this is a good thing for the Department and the taxpayers will be decided on a case-by-case basis.

Senator KEMPTHORNE. Okay, thank you. Senator Bingaman.

Senator BINGAMAN. Thank you very much, Mr. Chairman. I apologize for being late. I stayed over to make that vote right before you went to make that vote.

Let me ask a couple of questions about this Section 148 that you have proposed substantial changes in and let me start by saying that I certainly am open to the idea of changing the law in that regard. I think that it is probably entirely appropriate that we do so since it has not been honored and we have not had compliance in many respects, in most respects.

Let me just give a little background. There was a Defense Science Board study in 1988, which was a summer study that Mr. Perry and Mr. Deutch both served on, which came out with recommendations much along the lines of what we tried to legislate in Section 148.

It talks about the principal importance being the need to create a high-level forum to ensure the meshing of capabilities and objectives across the Federal Government, aimed at reversing the detrimental trend and include increased surge planning, more emphasis on the problems of the technology base, the development and implementation of integrated acquisition policy and create incentives for long-term industry planning and investment. So, they came out in favor of us doing something significant there.

As I read your recommendations and hear your testimony, it sounds to me like your proposal, essentially, is that Congress should back away from requiring anything and instead, essentially leave it up to the Department to do what studies it determines are appropriate at such times as it determines are appropriate and make such recommendations as it determines are appropriate at whatever point so that there is no institutionalized requirement that you look ahead.

I guess your characterization is that we really do not want top-down analyses. Instead, we want a bottoms-up approach. I have some real concern with that. Clearly we want a bottoms-up approach in the sense we want to be able to respond where we identify a problem.

But the idea of putting this planning process in place was to institutionalize a requirement that the Department look ahead, look beyond the horizon or over the horizon for technology needs it would have and institutionalize some cooperation between the Department and other Federal agencies, and to the extent that we could, incentivize cooperation between the Department and industry. That is sort of where we were.

Obviously the Department needs to be able to respond when there is a third tier supplier. I think you referred to the need to respond when a third tier supplier says they have got a problem. Clearly, we need to do that.

But I am more concerned about some of the bigger issues which I think are longer term for us. For example, in the National Critical Technology Report, that came out of the President's Office of Science and Technology Policy, it has a statement in here where it says, "With the exception of high definition displays and high resolution scanning, the United States is ahead or at least at parity in almost all fields comprising the information and communications technology category." Those are a couple of pretty big exceptions. It strikes me, and I am concerned that we just wait till someone calls this to our attention. I think we ought to be planning ahead to deal with those exceptions. If we take your suggestion and eliminate any requirement that that be done, I am concerned that it will not be done.

Mr. GOTBAUM. This is especially awkward, Senator, because I think we are doing exactly, not in form but exactly in spirit, what you just said.

Let me give you a for instance. You mentioned that the Critical Technology Report says that we are ahead in all things except and then it lists displays and one other, which I have forgotten.

Senator BINGAMAN. Scanning.

Mr. GOTBAUM. Scanning. Okay. I cannot tell you that I know what we are doing in scanning but I know rather considerably what we are doing in displays and what we did in displays was to do a review, led by the Department of Defense with interagency input, at the working level. It did not involve meetings of secretaries, it involved meetings of GS–15s and deputy assistant secretaries. It was actually led by my deputy, Ken Flamm.

Senator BINGAMAN. I am impressed by the effort you have made in that regard. My concern is that it was 10 years too late.

Mr. GOTBAUM. I think, Senator, I want to be very clear as to purpose. I think Chapter 148 was right and I think with the benefit of hindsight, the Department of Defense was not responsive to these concerns. I think that is the reason why you passed Chapter 148 and I think it is the reason why the Defense Science Board said in 1988 you ought to pay attention to these.

However, I think it is important to recognize that right now, the Department of Defense, which is led by former DSB member Secretary Bill Perry, former DSB member John Deutch, former DSB chairman Paul Kaminski, is in fact doing those issues and what I would argue is not that we should not be accountable for looking ahead, not that we should not be accountable for saying what our judgments are, but that the process by which we ought to be accountable is as part of the budget process.

That is really, if you want to get to the nub of it, that is really what we argue here. What we are arguing here is that in the same way that the Congress holds the Department of Defense accountable for weapons systems when it comes forward with a budget, it ought to hold us accountable in the R&D area and in the industrial base area when we do the budget.

What we had really proposed here was to say let us do it that way, let us come forward to you with a report every year concurrent with the budget saying, Congress, here is what we have done, here are the methods we have used, here are the judgments we have made, et cetera, so that you have at the time in which the power of the purse is directly applied an ability to say, Yes, you are following through on the spirit of Chapter 148 or yes, you are following through but I disagree with your judgments about it, which is certainly possible. Our judgments about flat panel displays are, at a minimum, controversial.

Senator BINGAMAN. I hear what you are saying, and I agree with the idea that you should generally tie any of this planning that occurs better to the budget process. Obviously, it is not worth doing if it is just going to be done in an academic sense.

My time is up. I will ask you another question in the next round.

Senator KEMPTHORNE. Mr. Secretary, my intention will be that each of us will have another set of questions that we will present to you now, and then I have additional questions that I will submit to you for the record, so that we can then move to the next panel, and allow them to make their opening comments.

Really, our target is that we will adjourn at 4 o'clock, to give everybody a sense of the time.

You stated, Mr. Secretary, with regard to dual-use, if I heard you correctly, that you acknowledged that there are some things that are defense-unique, period.

Mr. GOTBAUM. Absolutely, sir.

Senator KEMPTHORNE. And you said that our capabilities go down in some situations. So my question is, you have expressed concern about the growing U.S. dependence on arms exports to maintain our defense industrial base. Given the declining procurement budget proposed by this administration, how do you propose to reduce this dependence?

Mr. GOTBAUM. I am not sure that we can. Let me put it this way. I am certain that we cannot reverse the procurement budget back to the mid-eighties levels. I do not want to be presumptuous, since you are, after all, the Senate. But that clock is not going to be wound back.

It seems to us that the things that we can do follow along the lines of efforts we were already doing before. One is to broaden the capability base as much as we can. For example, let us take the areas which are undeniably defense-unique systems. One of the things that we can do that we are trying to do is to say, okay, but are component capacities capable of being dual use? Can we get commercial there? Can we broaden our base that way? That is one.

Two, we have tried wherever possible to reduce the impediments from our own regulatory processes on international commerce to support the industrial base. Because notwithstanding—and this is an area where, frankly, if I could, I would elaborate on my testimony—international commerce in the defense-unique area is variable, but it is also important. We recognize it is important.

One of the things we believe it is important to do is to try to make sure that it is impeded only when there is a good national security or foreign policy reason for doing so. And that is, for example, the reason why, again, Secretary Bill Perry from the Department of Defense, said the way we do export controls on computers does not recognize where the world is, and therefore the way we regulate computers no longer makes sense. Why do we not recognize commercial practice, so that we do not impede the commercial possibilities by our own actions?

Those are the areas where I think we can be helpful. I do not think we can pretend that we have the money, unfortunately, to expand the base on our own purse. Because the taxpayers will not provide it, sir.

Senator KEMPTHORNE. Let me pursue that then. Two years ago I offered an amendment to establish a defense export loan guarantee program at the Department of Defense. The loan guarantee authority was limited to NATO and major non-NATO allies. Would the Department of Defense support this type of program if it was self-financing?

Mr. GOTBAUM. My understanding is that the Department of Defense has said that it has no objections to this particular approach; that the administration has thus far not endorsed such an approach, sir.

Senator KEMPTHORNE. Mr. Secretary, again, we have discussed this, and it was part of your testimony here, about the Department having difficulty providing Congress with good data on the industrial base, and to point out, however, that this data is very important to the committee as we consider procurement programs. Can you describe the methodology that the Department will use to assess the defense industrial base and how you plan to share this data with Congress so that it is meaningful?

Mr. GOTBAUM. Yes, sir. Let me, if I may, use a concrete example on which we have delivered only half the goods, but half the goods, which is conventional ammo. We are procuring a lot less ammunition than we did before. It is not 100 percent defense-unique. It is probably only 99 percent defense-unique. But it is pretty close to a defense-unique item, most of these.

What did we do in this case?

We said it will cost money to do so. We need to focus our resources in those areas that are genuinely at risk. So let us go through a process of screening, which we have done to the first level. And the result of that screening process was a universe of companies. From our original 102, about a dozen, with methodological nuances, that we needed to go back further and take a look at.

What we have proposed—and this is in the nature of our Chapter 148—what we would propose is that we continue this analysis by doing serious study of those 12 companies. And if we decide that some of the taxpayers' dollars are necessary to be spent to support those capabilities, that in the budget we say so. And when we do the budget, we provide you with a report on what our method was and how we went through and what the study was and what the cost to the taxpayers is of this particular form of industrial base sustainment. In effect, to bring it out.

If we conclude as a result of this methodology that—excuse me—and the other point I should make is the kind of detail we gave you, we did not name companies' names. We did not give you companies' income statements. But we walked you through the methodology. We showed you what the template was. And, subject to the requirements of not revealing business data, we would be happy to answer questions as to what the method was.

If, as a result of this analysis, we conclude that ongoing procurement is sufficient, we would just say that. If we conclude, as a result of this, that in fact we need to spend some of the taxpayers' dollars to shore this up, there ought to be something included in the report. And that is really what we have proposed in 148. And that report would, again, cover the universe, cover the methodology, cover the conclusions, and cover the taxpayers' dollars that we would propose the Congress let us spend to sustain the base.

That is how we would go through it—case by case, sector by sector.

Senator KEMPTHORNE. All right. Thank you very much. Senator Bingaman.

Senator BINGAMAN. Thank you very much, Mr. Chairman.

Let me just ask, in the area of these industry sectors, you folks have done five studies, you have others under way, as I understand.

Mr. GOTBAUM. Yes, sir.

Senator BINGAMAN. Our defense procurement budget has dropped 71 percent in the last 10 years. Have your five studies revealed any serious problems in sustaining our defense industrial base?

Mr. GOTBAUM. Well, for example, the conventional ammunition study that I talked about gave us a universe of some firms that we are going to have to look at very closely. So the answer to that is yes. We are in the process of doing one now. I guess I should say in the space launch area, what we concluded is that, in general, the existing government policies and programs—because we have some—to sustain the space launch base were adequate. Not that there was theoretically no problem, but that they were adequate.

In flat panel displays, as I am sure you know, Senator, we concluded that there really was an issue and that we thought the taxpayers ought to spend some money to provide a reliable, dependable source of flat panel displays for the Department of Defense, and we proposed a total of $128 million of spending in fiscal year 1996 for that.

We are now working on some that we have not concluded, so I cannot tell you what the results are. But I will tell you we are looking at helicopters. It is clear, when you talk about drops in procurement, that the amount of money that we are spending in the helicopter area has dropped very, very considerably. And so this is an area where I cannot tell you that we will find a particular kind of problem, but it is clearly an issue that we know we will have to address.

Senator BINGAMAN. I guess my question is, are these not areas where we should have had those studies before we started cutting the defense procurement budget 71 percent? Would it not have helped us to sustain our industrial base if we had known when we started coming down what you are now finding out as you conclude some of these studies?

Mr. GOTBAUM. Not having been in the Department of Defense at the time, I am not going to assert that I know, but I hope that in making the budgets, as I know we do now, we do take into account industrial base issues.

The reason that I thought, frankly, the job was worth doing and that I thought the goals of Chapter 148 were admirable is that we were not doing so on a particularly consistent basis—but we were in fact worrying about them.

My experience, though, Senator, is that it is really only very rarely that a broad study gets you to enough information to make a detailed judgment. And I will give you the reasons why.

When we do broad data collection and broad studies, we can only ask questions broadly about the current situation—i.e., current profitability, current industrial organization of our suppliers. Yet, in order to answer the question of, Will you have a problem if you screw down another 20 percent? you need to go further. You need to say, what are the restructuring possibilities?

For example, to take a case which I know is of interest to this committee, if you had analyzed the overhead levels, the employment levels, et cetera, at Electric Boat 5 years ago and analyzed them today, you would come to different views about what the break-even were and the capabilities were.

If you look in our missile production area—the same story.

So it is not that the information is not desirable. It is desirable. But I will tell you that my experience has been proven, case after case after case, when we go for the general study, we do not get detailed enough on what ultimately turn out to be the real problem children.

My suspicion is that while we are doing a general study of the helicopter industry, I will tell you we are going down to specific cases. At the end of the day, the hard calls are going to be, what is the restructuring capability at a particular company? And that is really the kind of work that I believe is necessary for us and ultimately necessary for you.

Senator BINGAMAN. Let me ask one other question, which has been in the news somewhat recently. There have been reports that in this merger between Martin Marietta and Lockheed, some top managers—I think particularly at Martin—stand to receive tens of millions of dollars in bonuses as a result of the merger, and that DOD is going to pick that cost up.

Can you elaborate or tell us what your understanding of that situation is, and whether the taxpayers are going to be stuck with that?

Mr. GOTBAUM. Yes, sir. And I frankly appreciate your giving me an opportunity to respond on this issue on the record. I want to separate out two issues. The report that you read I believe to be profoundly false, misleading, erroneous, a real disservice to the Department of Defense and to the taxpayers.

What we do in the Department of Defense on cost-plus contracts—in other words, on contracts in which we are paying cost-plus, an award fee or cost-plus, we pay our share of costs for those. Costs include our share of the cost of the lowest production worker to a fraction of the cost of the chief executive. We have done it. We do it all the time.

We make sure in each case, by doing industry surveys, that we do not pay scales that are in excess of those paid to executives in other industries. So it is the truth that the Department of Defense, as part of its customary way of doing business, as it has for years, pays a fraction of the salaries and compensation of the senior executives of Lockheed and Martin and General Dynamics and United Defense, and a lot of other suppliers.

What we are not paying for is one penny more than we would have paid in the absence of that merger.

In the course of our discussions—because we reviewed that merger very intensively—it was a committee that I chaired within the Department of Defense under the Deputy Secretary—the company came to us and said, listen, you should know that we are going to disclose that we are taking certain forms of executive compensation that have been earned but not yet paid and certain stock options and bonuses, and we are going to pay them to our executives.

And our response was very clear: What your shareholders permit you to pay your executives is between you and your shareholders. But the taxpayers of the United States will not pay one penny more as a result of this merger than we would have paid in the ordinary course, and not one day earlier. And they agreed.

So, quite frankly, Senator, having gotten that agreement, knowing that the taxpayers are safeguarded, I did not even mention it—to give you an idea—when we did our review, I did not even mention this to the Deputy Secretary or the Secretary of Defense. I had satisfied myself we had gotten something in writing that said the taxpayers would absolutely not pay for this stuff.

We do not pay, you should know, for stock options ever. We do not pay for golden parachutes ever. So, frankly, the reports there I consider to be just profoundly false, sir.

Senator KEMPTHORNE. Mr. Secretary, thank you very much for your testimony and your insight. We appreciate it greatly.

I have some additional questions that I will submit to you.

Again, I thank you very much.

Mr. GOTBAUM. We appreciate very much the committee's interest in this. As you know, we share your concern that it is important, and hope we can do it as effectively as possible.

Senator KEMPTHORNE. Very good. Thank you so much.

Mr. GOTBAUM. Thank you, Mr. Chairman.

Senator KEMPTHORNE. Let me invite the next panel forward. Mr. Thomas Rabaut, who is president and CEO of United Defense; Mr. Don Fuqua, president of the Aerospace Industries Association; and Mr. Jacques Gansler, who is the senior vice president of The Analytic Sciences Corporation.

Mr. Rabaut, we will start with you. Again, I would note that all of you have submitted your testimony, which will be made part of the record. I would ask that you each, in your opening comments, that we keep it to 8 to 10 minutes. That would then allow both of us to have a couple of rounds of questions to you.

You have gotten a flavor of the discussion here with the Secretary. So I would just encourage you to be candid and blunt in the points that you want to drive home that we ought to learn from this hearing that may help you. Because that is what this is all about. So, Mr. Rabaut, if you would like to lead off.

STATEMENT OF THOMAS W. RABAUT, PRESIDENT AND CEO, UNITED DEFENSE LP, ON BEHALF OF AMERICAN DEFENSE PREPAREDNESS ASSOCIATION

Mr. RABAUT. Mr. Chairman, Senator Bingaman, I really appreciate the opportunity to talk to you today about the industrial base. And I will definitely stay under 10 minutes, and I will be blunt.

I am here on behalf of the American Defense Preparedness Association. We have 27,000 members and 650 corporate members.

My prepared statement has been submitted, and I request that it be entered into the record. And, with your permission, I will proceed with a short summary.

Senator KEMPTHORNE. Without objection.

Mr. RABAUT. It is my understanding that this hearing is being held in conjunction with the Department of Defense request to modify the current Chapter 148, Title X reporting requirements covering the defense industrial base. It is not my intention to comment on the proposed changes since I have not seen them in any detail other than what Josh just presented.

I would suggest, however, that it is time to reorient and streamline the current approach for assessing the state of the defense industrial base. In light of the current defense budget trends, the financial assumptions used for the future years defense plan, and the dramatic downsizing in the defense sector, we need to rethink our approach for the base and what we plan to do about it.

A number of you were involved with the initiatives incorporated into the Fiscal Year 1993 National Defense Authorization Act. Therefore, I will not highlight the major features in my short summary as I did in my prepared text.

However, it is quite clear to me that the Congress carefully considered the information needed, the processes involved, and the management required to make informed decisions about its viability as we downsize.

Since enactment of the Fiscal Year 1993 Defense Authorization Act, significant amounts of data have been gathered, and two reports have been released. But there is much more to be done, and the process must be streamlined if we can hope to make timely investment decisions.

While this was going on, the defense supplier base continued to contract, shrinking over the last 10 years by an estimated 75 percent, from 120,000 companies to 30,000 companies. According to Paul Kaminski, Under Secretary of Defense, another one-third of the current supplier base is likely to disappear.

For example, in the combat vehicle industrial base that supported the Cold War and Desert Storm, it is gone. Thousands of employees—10,000 in United Defense alone—hundreds of machine tools, and hundreds of thousands of manufacturing square footage is gone.

We are not a smaller version of the Cold War base. We are a new, different industrial base.

It is a base striving to consolidate so that significantly smaller volumes of vehicles can be designed, developed and produced economically.

Currently, there are no new tanks, no Bradley fighting vehicles, and no artillery pieces being built in the United States; only upgrades.

The public sector work force has also been reduced, although the reductions have not been of the same magnitude. And in this same period, public sector defense employment has been reduced 18 percent.

These conditions are not unexpected—at least in the business community—or limited to combat vehicles. Acquisition function emphasizes advanced technology developments and upgrades; and there is little or no production.

Given this situation, we need to reorient and streamline the way that we evaluate and report on the status of the base. I suggest an approach that becomes a material part of the annual programming and budgeting process.

First, we should focus our attention within each of the defense-unique sectors on the critical combat capabilities that must be maintained over time. These include such things as ships, fighter aircraft, bombers, helicopters, tracked combat vehicles, missiles, and munitions.

We start with our current platforms, and address whether they will require upgrade or replacement over time. This planning will shape our R&D investment to provide technology options. For each of these critical combat capabilities, the DOD must retain at least one full-service prime contractor to perform the design, system integration, production, and life cycle support for the upgrades or new systems planned. These prime contractors should be held accountable for ensuring that their critical subcontractors remain viable.

On the government side, there are core depot maintenance capabilities that are of concern. These capabilities are maintained in peacetime by maintenance workload funded with O&M dollars. We have found, by working with the Army, that there are win-win work-share arrangements that can set the standard for an investment strategy approach to manage both the public and private business.

I believe that we should optimize the way we spend the combination of R&D, procurement, and O&M dollars on each critical system. The key question which must be answered when budgets are formulated are: Does the investment satisfy a requirement for a critical capability? Will this investment of all colors of money sustain both the private and public components of the base? And, finally, if it does not sustain the base, what is the risk and what are our options?

For all sectors, the commercial industrial base must be a significant piece of the defense base.

Let me use an Army example that I am quite familiar with to help summarize my recommended approach. United Defense is the prime contractor for the Bradley family of fighting vehicles. All new production of Bradley vehicles have been completed. Therefore, we and the Army have been working together to ensure that, as we invest in essential upgrades, variant modifications at depot maintenance, we are also ensuring that the essential public and private parts of the base survive.

Our approach is as follows:

First, determine the requirements. This is an Army function that includes both the quality and quantity of all the vehicle types that make up the Bradley family.

Second, optimize the overall investment program by considering not only the individual vehicle requirements, but also the best business strategy and the impact on the total industrial base. In our case, this would be done by our program executive officer and his subordinate program managers who manage our systems in close coordination with the commanding general of the Tank, Automotive, and Armaments Command, and my company.

Third, assess the program and budget recommendations for its impact on the base. This is a high-level review; not detailed industrial planning. It is a state of the sector; not an exhaustive, wasteful study.

Fourth, as the Department of the Army formulates its annual program and budget, it should act to remedy any serious industrial base problems identified.

Fifth and finally, the Secretary of Defense should, as a part of his submission of the budget to the Congress, include a statement as to the adequacy of the budget to meet critical needs of unique industrial base elements and the level of risk being taken.

This approach would allow us to avoid reporting on those sectors that are not threatened, obviate the data collection demands on the Department of Defense and industry which have proven to be time consuming, expensive, and inadequate, strengthen the budget development, review, and execution processes. The budgets are developed and presented; would be evaluated in terms of whether they provided the capabilities needed; keep the base healthy; and are adequate to maintain essential capabilities in the future.

Let me stop at this point, and simply say that there are other complementary actions Congress can take that will advance the viability of the technology and industrial base. They are covered in my prepared statement, and I commend them to you for your consideration.

Thank you again for letting me express my views.

[The prepared statement of Mr. Rabaut follows:]

PREPARED STATEMENT BY THOMAS W. RABAUT, PRESIDENT AND CEO, UNITED DEFENSE LP

Mr. Chairman and members of the subcommittee, it is a pleasure for me to respond to your request to testify before you on the defense industrial base. I am here on behalf of the American Defense Preparedness Association whose 27,000 members and 650 corporate members represent the full spectrum of the technology and industrial base. While the testimony reflects my personal views, I can assure you that the entire ADPA membership shares my concerns about the future of our technology and industrial base.

It is my understanding that this hearing is being held in conjunction with the Department of Defense request to modify the current Chapter 148, Title 10, reporting requirements covering the defense industrial base. It is not my intention to comment on the proposed changes, since I have not seen them.

I would suggest, however, that it is time to reorient and streamline the current approach for assessing the state of the defense industrial base. In light of current defense budget trends, the financial assumptions used for this year's Future Years Defense Plan (FYDP), and the dramatic downsizing in the defense sector, we need to rethink our approach for the base and what we plan to do about it.

THE CURRENT APPROACH

A number of you were involved with the initiative incorporated into the Fiscal Year 1993 National Defense Authorization Act (Public Law 102–484). Therefore, I will only highlight some of its major features.

First, Public Law 102–484 appropriately focuses on the critical technology and industrial sectors of the base. The Congress has not treated the base as a homogeneous entity whose components are identical. More specifically, the focus is directed toward the current and projected capabilities of the prime contractors, subcontractors and defense industrial reserve.

Second, the law links the mandated annual reporting and assessment processes to three specific defense policy objectives which cover the components of the industrial base: research and development, manufacturing and production, and system support. A fourth objective concerns reconstitution;

Third, emphasis is placed on civil-military integration and elimination of barriers to greater utilization of commercial production;

Fourth, a National Defense Technology and Industrial Base Council headed by the Secretary of Defense is established. The Council's responsibilities include recommending changes to acquisition policy and maintaining interagency coordination.

It is clear that the Congress carefully considered the information needed, the processes involved and the management required to make informed decisions about the base.

Secretary Gotbaum and his staff, I believe, are working diligently to cope with the rapid changes in the base and to meet the congressional mandate.

RELATED DEVELOPMENTS

Since enactment of the Fiscal Year 1993 Defense Authorization Act, significant amounts of data have been gathered. To date, two reports have been released: The September 1994 initial report which outlines the Department's future plans and the February 1995 report which discusses space launch vehicles.

Reports on the helicopter, combat vehicle and torpedo sectors, along with reports on certain critical technologies, are planned over the course of this year. Also, the Department has standardized the questionnaire that will be used to collect information from industry. In terms of the industrial base, significant downsizing and consolidation have occurred, and more is expected. Defense budgets, particularly the investment accounts, have continued to decrease.

The Defense Supplier Base has contracted over the last 10 years by an estimated 75 percent (120,000 firms to 30,000). According to Paul Kaminski, Under Secretary of Defense (Acquisition and Technology), another one-third of the current supplier base is likely to disappear.

What is the impact? The combat vehicle industrial base that supported the Cold War and Desert Storm is gone.

Thousands of employees, 10,000 in united defense alone, hundreds of machine tools, and hundreds of thousands of manufacturing square footage is gone. We are not a smaller version of the Cold War base—we are a different industrial base. It is a base striving to consolidate so that significantly smaller volumes of vehicles can be designed, developed and produced economically. Currently there are no new tanks, Bradleys or artillery pieces being built. All new equipment are upgrades. This same story can be told for sector after sector.

The public workforce has also been reduced, although the reductions have not been of the same magnitude. In this same period, public sector defense employment has been reduced to 2.7 million positions from 3.3 million, an 18 percent reduction.

These conditions are not unexpected. Acquisition funding, for example, emphasizes advanced technology developments and upgrades. There is little or no production in the pipelines, order backlogs are diminishing and few new program starts are in the offing.

The new defense plan assumes additional investment funds will materialize because of savings and adjustments in other areas. In fact the procurement accounts are projected to increase by nearly $28 billion over the fiscal 1996–2001 period. Research and development, on the other hand, shows a steady downward trend.

Savings from further infrastructure reductions and acquisition reform account for the Department's projected ability to increase acquisition funding. It is not my intention to dispute the Department's plan. But, it should be understood that modernization and therefore future military readiness depends on the success of the proposed 1995 Base Realignment and Closure round (BRAC) and the acquisition streamlining implementation.

The Department has indicated that another BRAC round would be beneficial. The members of this subcommittee are in a better position than I am to comment on the likelihood of the Congress enacting another base closure law.

The regulatory phase of acquisition streamlining is underway. Secretary Perry and his team, including Deputy Under Secretary Colleen Preston, deserve high marks for their efforts to transform the Department of Defense into a world class buyer. It is my hope that the current regulatory implementation process will be as supportive, produce the results Congress envisioned and meet all our expectations.

A DIFFERENT APPROACH

Given this industrial base status, we should reorient and streamline the evaluation and reporting of the industrial base.

First, we should focus our attention, within each of the Defense-unique sectors, on the *critical combat capabilities* that must be maintained over time. These include such things as ships, fighter aircraft, bombers, helicopters, tracked combat vehicles, missiles and munitions. We obviously start with our current platforms and must address whether and how they will require upgrade or replacement over time. This planning will shape our R&D investments to provide technology options. For each of these critical combat capabilities, the DOD must retain at least one full service prime contractor to perform the design, system integration, production and life cycle support for the upgrades or new systems planned. These prime contractors should also be held accountable by the Government for ensuring that their critical subcontractors and vendors remain viable and that small and disadvantaged businesses are supported. Prime contractors must demonstrate imagination and innovation in reducing the cost of delivering required systems including an aggressive approach to incorporate the commercial sector into the equation. On the Government side of the industrial base, there are core depot maintenance capabilities that are of concern for the same critical systems. As you know, these capabilities are maintained in peacetime by maintenance workload funded with O&M dollars. We have found by working with the Army that there are win-win work sharing arrangements that can set the standard for an investment strategy approach to managing our business. I believe that in these days of reduced resources that we should optimize the way we spend the combination of our R&D, Procurement and O&M dollars on each critical system—and that the key questions which must be answered when budgets are formulated are:

(1) Does this investment provide the required critical combat capability?

(2) Will this investment (of all colors of money) sustain both the private and public components of the base?

(3) If this does not sustain the base, what is the risk?

For some sectors the commercial industrial base will also be the defense base. Things like computers and other high volume electronic components are truly dual use and the services need only be smart buyers of what is already available.

What I am describing is a requirements driven program and budget process. What I am proposing is a creation of a new "integrated process" review to consider or address the impact of proposed resource allocations on the sector industrial base. This is not a means to pick winners and losers; the procurement process will determine the survivors. This is an industrial base health check.

Second, Congress should request a report from the Department of Defense, as a part of its budget submission, on what sectors of the base are placed at risk and the Department's assessment of that risk.

The key consideration is to get the Department and industry to work together on the development of necessary information and strategy evaluation. This is where the issue of streamlining or augmenting the process comes into play.

Let me use an Army example that I am quite familiar with to help summarize my recommended approach. United Defense is the prime contractor for the Bradley Family of Fighting Vehicles. The Family consists of the M2 Infantry Fighting Vehicle, the M3 Cavalry Vehicle and several variants for other critical combat functions. These include the launcher platform for MLRS and TACMS missiles, the fire support vehicle for the field artillery, the Stinger Fighting Vehicle for forward area air defense and a command and control vehicle for infantry and armor commanders. All new production of the Bradley Vehicles has been completed. Therefore, we and the Army have been working together to insure that, as we invest in essential upgrades, variant modification and depot maintenance, we are also insuring that the essential public and private parts of the base survive.

Our approach to date is the basis for my suggesting a model for coupling industrial base planning with the programming and budgeting process. Let me run through the major steps:

1. Determine the requirements. This is an Army function that includes both the quality and quantity of all the vehicle types that make up the Bradley Family.
2. Optimize the overall investment program by considering not only the individual vehicle requirements but also the best business strategy and the impact on the total industrial base. In our case, this would be done by our program executive officer and his subordinate program managers who manage our systems, in close coordination with the commanding general of the Tank Automotive and Armaments Command, who directs core depot workload, and my company.
3. This process results in an coordinated recommendation for the program and budget and should carry with it the program executive officer's coordinated assessment of the impact on the base.
4. As Department of Army formulates its annual program and budget it should act to remedy any serious industrial base problems identified and include its assessment along with the budget submitted to the Secretary of Defense.
5. Finally, the Secretary of Defense should, as a part of his submission of the budget to the Congress, include a statement as to the adequacy of the budget to meet sustainment of the defense critical elements of the industrial base and the assumed risks.

Mr. Chairman, this briefly outlines a possible alternative to the current approach which should both streamline the current process and facilitate the necessary oversight by the Congress. It would:

- Allow us to screen out those sectors that are not threatened.
- Obviate the data collection demands on the Department of Defense and industry which have proven to be time consuming, expensive and inadequate.
- Strengthen the budget development, review and execution processes. The budgets as developed and presented, if authorized and appropriated, would be evaluated in terms of whether they (a) provide the capabilities needed; (b) keep the base healthy; and (c) are adequate to maintain minimum essential capabilities in the future.

Mr. Chairman, simply stated, this streamlined investment strategy approach is designed to link the industrial base assessment and budget processes.

I am told that the Air Force and Navy have already adopted a process like this whereby program executive officers and project managers of the critical systems present their investment strategies, which include R&D, Procurement and O&M dollars to be spent along with their assessment of the resultant impact on the industrial base. I am also aware of the fact that the Army is considering a similar approach.

Mr. Chairman, this approach requires that a constructive Government-industry partnership is forged. It also means that we confine our focus to the minimum essential combat capabilities and we look at the procurement, research and development, and operation and maintenance funding available for investment in those capabilities.

This investment strategy combined with industry's ability to take the necessary management actions to survive on upgrades and low production rates at least for the foreseeable future represents an alternative to the current effort.

OTHER RECOMMENDED ACTIONS

There are other complementary actions Congress can take that will advance the viability of the technology and industrial base.

First, industry must be allowed to continue restructuring both externally and internally. In the case of my own company, which results from merging the defense elements of FMC and Harsco, we undertook a number of internal streamlining actions which enabled us to hold the price of Bradley Fighting Vehicles constant while reducing the production rate by 50 percent. We are similarly organizing to produce our other products at affordable lower rates.

Second, the first phase of acquisition streamlining must be successfully implemented. We have already sustained a $300 million cut in the fiscal year 1995 procurement appropriation accounts on the basis of claimed reform savings. This reduction is before the regulatory process started.

Also, we need to continue efforts to improve the current system. I would encourage your careful consideration of the follow-on acquisition streamlining recommendations that have been submitted to the subcommittee.

Third, we need to enhance our international competitiveness. Elimination of the R&D recoupment fee, establishment of a defense export loan guarantee program and holding the line on FMS infrastructure costs, are important initiatives that need your support. Allowing the use of FMS sales proceeds from inventory equipment to fund upgrades of remaining equipment would be very beneficial to the industry.

Fourth, support for and adoption of the Department of Defense's new "depot policy" is recommended. More private industry involvement and partnerships with the depots is needed to realize the capabilities of both the private and public sectors.

Finally, greater budget stability is essential to the industrial base. Expanded use of multiyear contracts will reduce program and business turbulence.

CONCLUSION

Mr. Chairman, as indicated earlier, I have not seen the Department of Defense's proposed changes to Chapter 148; therefore, I am not in a position to comment on them. I have, however, offered another perspective on how Congress could exercise its oversight of the Defense Industrial Base, which I hope the subcommittee finds helpful.

In this era of declining budget resources, it is essential that we employ a coherent investment strategy for modernization. I recognize that near-term readiness is a top priority, as it should be. I recognize also that investment in modernization is the key to future readiness. Our experience in the Gulf War underscores this point.

As my colleague Norm Augustine observes, "the systems we used represented the technology of the 1960s, the development of the 1970s and the production of the 1980s—all utilized by the people of the 1990s."

In sum, Mr. Chairman, the decisions made today will have significant bearing on our abilities to protect our troops and carry out our national security objectives in the early part of the next century. The margin for error is minimal; therefore, we should make certain that our modernization efforts and our technology and industrial bases are sustained.

Senator KEMPTHORNE. Mr. Rabaut, thank you very much. We greatly appreciate it. Mr. Fuqua, if you could present us with your comments.

STATEMENT OF DON FUQUA, PRESIDENT, AEROSPACE INDUSTRIES ASSOCIATION

Mr. FUQUA. Thank you, Mr. Chairman and Mr. Former Chairman. I appreciate the opportunity to be here representing the Aerospace Industries Association.

The aerospace industry is unique. It is a private industry doing commercial business over a broad spectrum, and at the same time it is a vital component of the U.S. defense system.

Since World War I, it has been national policy to rely on the private sector for the greater part of the defense R&D effort, and for the production of weapons and equipment for the Armed Forces. It is a collaboration that has demonstrably served this Nation very well. It is doubly important today as we adapt to a new defense strategy and structure.

The defense plan assumes that industry will generate a flow of advanced technology at least in the defense-critical technologies, as a force multiplier measure for the smaller defense force, and expand production to weapon systems to reconstitute the armed forces should a global threat emerge.

These assumptions are valid only if the industry is able to maintain its capabilities for advanced R&D and production of high-technology equipment. By capabilities, I mean live facilities for advanced R&D, sophisticated production tooling and equipment, an adequate force of skilled labor, an adequate base of competent lower-tier suppliers, and an adequate level of capital investment.

Maintaining these capabilities requires a certain level of work load, and many are concerned that it may slide below that level.

We are moving toward a hollow industrial base, one that may not create an environment that allows industry to respond in an uncertain future.

The overall DOD budget was reduced by some 35 percent in real terms since the peak level of the mid-1980s through 1994. By 1996, the procurement budget will have been cut by more than twice that much—71 percent. That reflects the fact that the administration has concentrated on readiness at the expense of modernization, and has steepened the rate of decline in the defense industry, and has inadvertently weakened the industrial base that it seeks to strengthen.

As we wind down the 10th year of defense restructuring and industrial downsizing, the aerospace industry has lost 37 percent of its overall work force. In military aircraft production, we have lost 42 percent of the labor force in place in 1987. Our companies have closed down more than 84 million square feet of plant space. We have lost by one estimate three out of every four suppliers doing defense business a decade ago.

Defense has also shrunk as far as force levels are concerned, but reductions in the infrastructure have lagged. Where overall defense appropriations are down 35 percent, infrastructure funding associated with operations and maintenance has been reduced by only 18 percent.

The Nation continues to maintain a Cold War infrastructure, while all of the other elements of the defense system are being drastically scaled back.

The list of base closures recently recommended by DOD is a counterproductive proposal that has disappointed and frustrated the defense industry. By backing away from shutting down much of its excess capacity, DOD has opted to continue paying a high fixed cost associated with unnecessary capacity. These expenditures directly affect the industrial base, because they will inevitably influence the funding available for weapons R&D and modernization programs.

The problem is exacerbated by a trend in which maintenance and repair operations are being increasingly conducted by the government at the expense of the defense industry to justify the retention of excess capacity.

Congress has supported this trend by restricting the amount of depot maintenance work that can be contracted to industry. These actions are not consistent with the interests of national security.

In response to your specific request for suggestions on how to amend Chapter 148 of Title X to ensure a thorough and timely consideration of the industrial base concerns, it is clear from the foregoing that this is an issue that is becoming increasingly critical. I do not know what changes DOD has proposed or will propose, but the concept of sector capability analysis should not be abandoned.

The current emphasis on dual-use technologies, greater use of commercial products, and simplifying the acquisition process to encourage more suppliers to do business with the government are all steps in the right direction. These initiatives will still not do and cannot ensure that the critical needs will be met in any given warfighting scenario. That cannot be left to chance.

The assessment required by Chapter 148 may be more global than necessary to address the issues of specific capabilities to meet specific requirements. I believe that DOD should be required to identify those sectors where critical capability is, or will be critical, for the foreseeable warfighting scenarios, and that it conduct surveys to determine, mainly, whether there is adequate capacity available; and if so, how to preserve it and ensure that it will still be available when it is actually needed; and if not, what steps need to be taken to establish the capability.

This is clearly not a simple, one-time effort because there are a large number of factors that must be weighed, and because these are all various scenarios that are not static.

In my judgment, this makes it even more imperative that nothing be left to chance. Matching up planned or perceived needs with available or potential resources, supplemented by acquisition streamlining and other initiatives, can ensure a viable defense industrial base.

Secretary Perry is to be complimented for his efforts to deal with this multifaceted problem, and for establishing the Office of Economic Security to focus on it. I am pleased to say that that office has reached out to forge a positive relationship with industry, thanks to the leadership of Secretary Gotbaum, who was just here.

I would like to offer an AIA consensus on a menu of other actions that could and should be taken to prevent further deterioration of the defense industrial base.

There exists a serious imbalance in the defense budget that must be corrected. This imbalance is a result of the emphasis on current readiness at the expense of future readiness. The budget must foster both readiness and modernization, and there must be a better balance between procurement, operations and maintenance, and R&D funding.

There is also a costly imbalance arising from the rate of reduction of government capacity, particularly in the area of depot maintenance facilities, which must be accelerated. The trend of shifting work from the defense industry to the government depots must be reversed. AIA has long contended that the bulk of the defense O&M modernization and upgrade work should be conducted by industry.

The industry strongly supports the DOD report produced last year detailing the issue of depot maintenance policy. The industry truly believes that there are some core functions that should rightly remain with the government. But this core concept should be interpreted narrowly.

Exports of defense equipment is an area where we could use help from our government. Defense exports, which have been running about $12 billion a year, cannot substitute for a loss of $40 billion to $50 billion in our procurement budget. But they can play an important role in keeping our subcontractor base alive and our production lines open, and especially at a time when much of our procurement budget is being spent on developing new systems that will not go into production for several years.

Similarly, eliminating the requirement for recoupment charges on government sales would lower our prices and make our products more competitive. Providing defense contractors access to some form of export credit guarantee would help us in some markets where countries want to spread their payments over at least part of the expected life span of the equipment being purchased. And we need to relax somewhat our restrictions on technology transfer, particularly to our closest allies.

The Federal Acquisition Streamlining Act of 1994 is a measure of immense importance to the industrial base. It must be carefully monitored, though, throughout this implementation process to ensure that the implementing regulations fully accomplish the streamlining simplification intended by the legislation, and that potential savings become real savings.

Accomplishing these measures would significantly buttress the defense industrial base by providing industry with additional work load and by enabling new efficiencies in the industry's operation.

For 10 years, the matter of the defense industrial base has been brushed under the rug, Mr. Chairman. And there is no more room under the rug. It is time for positive action if the Nation is to have the kind of defense system the uncertain times demand.

Industry's capabilities for force modernization and emergency expansion are fundamental to the defense concept that we are pursuing, and we cannot allow further deterioration of those capabilities.

Thank you very much.

[The prepared statement of Don Fuqua follows:]

PREPARED STATEMENT BY DON FUQUA, PRESIDENT, AEROSPACE INDUSTRIES ASSOCIATION

I am Don Fuqua, president of Aerospace Industries Association (AIA). AIA is the trade association representing 50 of the Nation's leading manufacturers of commercial, military and business aircraft, helicopters, aircraft engines, missiles, spacecraft and related components.

Our industry is unique. It is a private industry doing commercial business over a broad spectrum, and at the same time, if is a vital component of the U.S. defense system. Since World War I it has been national policy to rely on private industry for the greater part of the defense R&D effort and for the production of weapons and equipment for the Armed Forces. It is a collaboration that has demonstrably served this Nation well.

It is doubly important today as we adapt to a new defense strategy and structure. The defense plan assumes that industry will generate a continuing flow of advanced technology, at least in the defense-critical technologies, as a force-multiplying measure for the smaller military force. It also assumes that the industry will be able to expand production of weapons systems to reconstitute the armed forces should a new global threat emerge.

These assumptions are valid only if the industry is able to maintain its capabilities for advanced R&D and production of high-tech equipment. By capabilities I mean 'live' facilities for advanced R&D, sophisticated production tooling and equipment, an adequate force of skilled labor, an adequate base of competent lower tier suppliers and an adequate level of capital investment.

Maintaining those capabilities demands a certain level of workload and many in our industry are concerned that we may slide below that level. We are moving toward a hollow industrial base, one that may not create an environment that allows industry to respond in an uncertain future with the superior technology and cost-effective production the armed services are counting upon and have grown accustomed to expect.

Where the overall DOD budget has been reduced by some 35 percent in real terms since the peak level in the mid-1980s, the procurement budget has been cut by more than twice as much, 71 percent. That reflects the fact that the administration has concentrated on readiness at the expense of modernization and, in so doing, has steepened the rate of decline in the defense industry and inadvertently weakened the industrial base it seeks to strengthen.

As we wind down the 10th year of defense restructuring and industry downsizing, the aerospace industry has lost 37 percent of its overall work force. In military aircraft production, we have lost 47 percent of the labor force in place in 1987. Our companies have closed down some 84,000,000 square feet of plant space. We have lost, by one estimate, three out of every four suppliers doing defense business a decade ago.

The Government element of defense has also shrunk as far as force levels are concerned, but reductions in the infrastructure have lagged. Where overall defense appropriations are down 35 percent, infrastructure funding associated with operations and maintenance has been reduced only 18 percent. The Nation continues to maintain a Cold War infrastructure while all other elements of the defense system are being drastically scaled back.

A case in point is the list of base closures recently recommended by DOD, a counterproductive proposal that has disappointed and frustrated the defense industry leadership. By backing away from shutting down much of its excess capacity, DOD has opted to continue paying the high fixed costs associated with unnecessary capacity. Those wasteful expenditures directly affect the defense industrial base, because they will inevitably influence the funding available for weapons R&D and modernization production.

The problem is exacerbated by a trend in which maintenance and repair operations are being increasingly conducted by the Government, at the expense of the defense industry, to justify the retention of excess capacity. And the Congress has supported this trend by restricting the amount of depot maintenance work that be contracted to industry. These actions are not consistent with the interests of national security.

In response to your specific request for suggestions as to how to end Chapter 148 of Title 1 to help ensure a thorough and timely consideration of industrial base concerns, it is clear from the foregoing that this issue is becoming increasingly critical. I do not know what changes DOD has proposed or will propose, but the concept of sector capability analyses should not be abandoned.

The current emphasis on dual-use technologies, greater use of commercial products, and simplifying the acquisition process to encourage more suppliers to do business with the Government, are all steps in the right direction. However, these initiatives still do not and cannot ensure that the critical needs will be met in any given warfighting scenario. That cannot be left to chance.

The assessment required in Chapter 148 may be more global than necessary to address the issue of specific capabilities to meet specific requirements. I believe that DOD should be required to identify those sectors where industrial capacity is or will be critical for foreseeable warfighting scenarios, and then conduct surveys to determine: (1) whether there is adequate capacity available; (2) if adequate capacity avail, how to preserve it and ensure that it will still be available when actually needed; (3) if not, what steps need to be taken to establish the capability. This is clearly not a simple one-time effort, because of the large number of factors that must be weighed and the fact that the various scenarios are not static.

However, in my judgment, this makes it even more imperative that nothing be left to chance. Matching up planned or perceived needs with available or potential resources, supplemented by acquisition streamlining and other initiatives, can ensure a viable defense industrial base, but one that will still demand continuing attention.

Defense Secretary Perry is to be complimented for his efforts to deal with this multifaceted problem, especially for establishing the Office of Economic Security to focus on it. I am pleased to say that the office has reached out to forge a positive relationship with industry, thanks to the leadership of Secretary Josh Gotbaum. He was an outstanding choice to fill that office.

In addition to the above suggestions with respect to the matter of sector analyses, I would like to offer an AIA consensus on a menu of other actions that could and should be taken to prevent further deterioration of the defense industrial base.

- There exists a serious imbalance in the defense budget that must be corrected if this nation is to have an effective warfighting capability. This imbalance is the emphasis on current readiness at the expense of future readiness. The budget must foster *both* readiness and modernization, and there must be a better balance between procurement, operations and maintenance, and R&D funding.
- There is also a costly imbalance in the rate of downsizing of the respective Government and industry infrastructures. Reduction of Government capacity, particularly in the area of depot maintenance facilities, must be accelerated.
- The trend of shifting work from the defense industry to Government depots must be reversed. AIA has long contended that the bulk of the defense O&M, modification and upgrade work should be conducted by industry, enabling our companies to keep more of our skilled workers and retain more of their high-tech capabilities.
- The industry strongly supports the DOD report produced last year dealing with the issue of depot maintenance policy. The Industry truly believes that there are some 'core' functions that should rightly remain with the Government, but this 'core' concept should be constructed narrowly and provide the military a degree of confidence necessary in carrying out its mission.
- Exports of defense equipment is another area where we could use some help from our Government. Clearly defense exports, which have been running around $12 billion a year, cannot substitute for a loss of $40–50 billion in our procurement budget. But they can play an important role in keeping defense production lines open and our subcontractor base alive, especially at a time when much of our procurement budget is being spent on developing new systems that will not go into production for several years.

In particular, eliminating the requirement for recoupment charges on government to government sales would lower our prices, making our products more competitive. Providing defense contractors access to some form of export credit guarantee would help us in some markets where countries want to spread their payments over at least part of the expected lifespan of the equipment being purchased. All of our competitors have access to such credits, we do not. And we need to relax somewhat our restrictions on technology transfer, particularly to our closest allies, if companies are to be able to work on cooperative projects that might lower costs to the U.S. military.

- The Federal Acquisition Streamlining Act of 1994, a measure of immense importance to the industrial base, must be carefully monitored throughout the implementation process to ensure that the implementing regulations fully accomplish the streamlining simplification intended by the legislation and that the *potential* savings become *real* savings. There is also need for amendments to the law, or new legislation, to address certain key issues remaining. AIA strongly supports the recommendations submitted to Congress by the Acquisition Reform Working Group.

Accomplishment of these measures would significantly buttress the defense industrial base by providing industry with additional workload and enabling new efficiencies in the industry's operations.

For 10 years the matter of the defense industrial base has been brushed under the rug. There is no more room under the rug. It is time for positive action if the nation is to have the kind of defense system the uncertain times demand. Industry's capabilities for force modernization and emergency expansion are fundamental to the defense concept we are pursuing; we cannot allow further deterioration of those capabilities.

Senator KEMPTHORNE. Mr. Fuqua, thank you very much. Dr. Gansler.

STATEMENT OF JACQUES S. GANSLER, PH.D., SENIOR VICE PRESIDENT, THE ANALYTIC SCIENCES CORPORATION

Dr. GANSLER. I guess after listening to the first two panel members, I should say that I am not here representing anybody. In fact, neither my company nor the Defense Science Board, although I would be happy to answer the question that Senator Bingaman raised about the 1988 study if you want to during the question-and-answer period.

I would like to start from the point that has been raised frequently—namely, that there has been a 70 percent or more decrease in the procurement account, and that while we have been able to essentially not buy weapons over the last 10 years, it is very clear that we have handled it from the military side by simply reducing the force sizes and retiring old weapons. This approach has gone about as far as it can go, and we are now going to have to modernize the forces or otherwise we are going to have obsolete and aging weapons.

On the industrial side, what we have been able to do over this 10-year period essentially is a combination of three things. We have consolidated and downsized. We have had extensive foreign military sales. And we have been living off the backlog of the unfilled orders that built up in the eighties and nineties. Again, I believe that these solutions for maintaining the defense industrial base simply will not work much longer.

Now, when the defense budgets were high, the Nation could afford the high cost of its weapon systems and, simultaneously, the high cost of maintaining its defense industrial base. Today, it is very clear that we need some new solution that can reduce both of these costs.

I would argue that two major trends that have taken place allow this to happen. The first is on the military side, the shift from attrition warfare to information-based warfare. And the second is the parallel activity within the commercial world to dramatically move forward in the information age.

Through research and development investments on both the R&D and the engineering side, the commercial world is obviously now way ahead in many areas, such as software, manufacturing technology, new materials, and so forth. And it is up to the DOD to draw heavily upon that, especially if we are going to get equipment at an affordable price that meets the military requirements in terms of environment and performance.

I want to highlight one other major change that has taken place during this time period, and that is the manufacturing model that is used in the commercial world. We have shifted from a mass production model, where the idea was to try to build lots of things to reduce the cost, to a flexible model in which the idea is to have different types of products being able to be built on the same line.

So, therefore, you could have, for example, military electronics and commercial electronics being built on the same line, and you would still have a defense-unique military item being built along with these large quantities of commercial items.

An extreme example of this would be the one I mentioned in my prepared testimony, about the cannon, which is clearly a military-unique item. It could be built on the identical rotary forge that railroad cars axles are built on. So you can have a line that does both the cannons and railroad car axles, and then if you wanted to surge, you would simply change the tape.

Now, why that is so significant is when we talk about military-unique, we have to define it not only in terms of the product, but also in terms of the process. And that is very much different than the way we have traditionally viewed it.

Given these developments, it is very clear that the DOD has to draw heavily on the commercial industrial base. And that leads us to this dual-use or integrated base. I want to emphasize that that has nothing to do with an industrial policy. Rather, it is simply removing the current barriers that exist to being able to integrate the civil and military world and creating incentives such that firms who are now in the defense world will diversify into the commercial world, and firms that are in the commercial world will, in fact, be interested in doing defense business.

I might point out that unfortunately in recent years this has been exactly in the opposite direction from what has actually been happening. In other words, firms that were world-class firms that had been in the defense business are simply leaving it. Other firms that have had integrated facilities, as a result of the increased regulation in the late eighties particularly, have separated their activities—like Boeing separated their commercial and military transports.

So what we are having is a separation of the industrial base rather than an integration of it, which needs to happen.

When companies are asked why, they reply that it is unique government oversight requirements, unique procurement practices, unique military specifications. These are the barriers that are now being addressed by the Department of Defense. And under Secretary Perry's personal leadership, things are starting to happen there.

I might also compliment the Congress on their initial acquisition reform legislation of 1994. But I would argue very strongly that much, much more has to be done to remove the barriers to commercial and military integration.

For example, the Federal Acquisition Streamlining Act of 1994, while a significant step toward buying commercial items does not address the big cost, which is integrating facilities. And so much more needs to be done in that area.

Additionally, I would argue that simply removing the barriers is not enough, and that we have to create incentives. And I think these incentives need to be created for commercial firms to want to do defense business and for defense firms to want to diversify.

I would argue that the Technology Reinvestment Project of ARPA is an example of one such incentive. And I have described that more in my prepared testimony.

Let me also note that the point which was just raised, that as the defense budget has declined, a very significant and I think very adverse trend toward achieving an efficient and effective 21st century defense industrial base has been the attempt—and I would argue by both the military and the Congress—to maintain a very large and very redundant industrial capability in the public sector.

The impact of this has been while the private sector suppliers have been dramatically downsizing, there has been an increasing share of the work going in-house to the government depots, the government arsenals, the laboratories, and the pseudo-governmental, federally funded research and development centers. I believe this is basically a socialization of the defense industrial base. And it eliminates the benefits of technological advancement and lower costs provided by free market competitive forces.

It also removes tens of billions of dollars of defense business from effective commercial and military integration. So I feel those trends also have to be stopped. They are no longer affordable or desirable.

Now, to go to where the law (Chapter 198 of Title X) specifically applies, I think there will be a few areas in which government support for assuring a defense industrial capability will still be required. But these have to be minimized. Specific criteria have to be established, and these need to be done in order to then lead to sector-by-sector analyses in the few problem areas—always, again, with the objective of maximizing the potential for commercial and military integration.

I believe Secretary Gotbaum and his staff have begun this process.

The decision to subsidize a continuation of an unneeded weapons production line or to subsidize R&D and procurement of state-of-the-art military equipment, which could be purchased offshore, are extremely expensive and, I admit, very difficult choices. However, they should not be allowed, as they frequently have been, to be easily justified on the simple statement of "maintaining the defense industrial base."

In fact, I would argue that in many cases, maintaining the current defense industrial base is absolutely the wrong thing to do.

When we consider what America actually needs for the 21st century, in terms of its defense industrial base, I think three criteria stand out overwhelmingly. First is state-of-the-art weapons performance; second, assured access to critical technologies; and third, the potential for future production, should it be required.

Now, achieving the first of these—namely, state-of-the-art capability—requires adequate funding of at least two small, competitive teams of systems engineers in each of the major weapons areas. These people would be designing, integrating, manufacturing, and testing low-cost, fieldable, producible, and supportable prototypes of next-generation systems.

Now, one of those two competitive teams could well be an ally's industry, offshore, to maintain competition.

Also, the overwhelming share of the subsystems, parts, and materials for these future weapons should come from commercial sources. And I believe, in many cases, even the system design teams can come from within commercial firms. Although, there again, working on differentiated products—namely, defense products.

The second requirement, assured access, does not require national self-sufficiency for all subsystems, parts, and so forth. The issue is really vulnerability, not foreign dependency.

As long as there are multiple sources in multiple countries offshore, then there is neither military nor economic vulnerability.

However, if we get down to the point where there are very few—one or two—sources in one or two countries, then maybe action is required to assure invulnerability.

Finally, the third requirement—namely, the potential for future production—does not require that there be any current production underway. Obviously, when there is not, there has to be a clear plan available. But frequently this can be satisfied either from the planning associated with the prototype engineering and manufacturing effort, or even by a planned conversion of an existing commercial, flexible manufacturing operation.

The lack of this requirement for current production has very significant implications for the level of government subsidization needed in order to maintain a viable defense industrial capability. And it brings into question the need for continued aggressive U.S. foreign sales of advanced weapon systems.

I might note that the United States now supplies 73 percent of the world's arms demands. And many believe that this does not have a positive long-term security implication in terms of peace and stability in the world.

In summary, America has essentially two choices for its future weapon systems and its supporting industrial base. Either it can continue on the historic trend of buying equipment from isolated, expensive, and increasingly obsolete defense industrial suppliers—unique suppliers—thus yielding extremely expensive weapon systems that take literally decades to develop and produce, or it can shift to a strategy in which the DOD draws extensively upon a far broader industrial base that supplies world-class products to both the military and the commercial world.

In this latter model, the DOD will have the ability to acquire state-of-the-art weapon systems in sufficient quantities to be militarily effective, because they are going to be much lower cost.

To achieve this latter alternative, significant efforts have to be made to remove the current barriers to commercial/military integration, in terms of the accounting practices, the procurement practices, and the military specifications that are unique, and, simultaneously, to create incentives for industrial integration.

I think the choice is obvious. The effort, however, will be very difficult, and will require strong support from both the Congress and the administration.

Thank you.

[The prepared statement of Dr. Gansler follows:]

PREPARED STATEMENT BY JACQUES S. GANSLER,[1] SENIOR VICE PRESIDENT, THE ANALYTIC SCIENCES CORPORATION

A "DUAL-USE" INDUSTRIAL BASE FOR DEFENSE

Today, America is the only military superpower; the challenge is to maintain this posture well into the 21st century. To achieve this objective, the DOD must, in the near term, maintain the readiness of the forces—something which both Congress and the DOD have been actively pursuing—and, for the longer term, continue to modernize the forces, in order to maintain the military technological superiority on which America's defense strategy is based. Achieving these two objectives with greatly reduced defense budgets, will be extremely difficult.

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In order to keep up force readiness, funding for operation and maintenance of the forces has gone down by only 12 percent over the last 10 years. While, at the same time, the budget for procuring new weapons has plummeted by 70 percent (in constant dollars). The DOD has been able to weather this decade, of essentially not buying new weapon systems, by cutting back on force sizes and retiring old weapon systems. However, both the Congress and the administration now feel this approach has gone far enough, and, unless the DOD buys new systems over the coming decade, it will face the 21st century with increasingly obsolete and aging weapons. On the industrial side, the nation has been able to maintain a viable defense industry through the combination of three actions: dramatic downsizing and consolidation; extensive foreign military sales (the United States now supplies over 70 percent of the world's arms market); and living off the backlog of unfilled orders that had built up during the Reagan and early Bush years. *These solutions for maintaining defense industrial capability won't work much longer.*

When defense budgets were high, the Nation could afford both the high cost of its new weapon systems and the high cost of maintaining its defense industrial base. Today, a new solution is required to reduce the cost of weapons and to provide an industrial base that is affordable and yet state-of-the-art. Fortunately, two major trends make these objectives achievable.- The first is the shift in the nature of warfare, from the historic model ("attrition warfare") in which large masses of heavy forces wore each other down, to modern battlefield concepts ("information-based warfare") which utilize real-time satellite and aircraft reconnaissance data to command and target smart weapons—as was demonstrated so effectively in the Persian Gulf war. Thus, for future weapon systems, the DOD must focus its resources on advanced information technology. Second, and in parallel, the information age explosion in the commercial world has caused large investments (in both engineering and manufacturing technologies) that have actually put the commercial world well ahead of the defense world in many technologies that are critical to defense. Thus, in order to obtain state-of-the-art capability, defense has no choice but to extensively draw on the commercial industrial base (in areas as wideranging as electronics, software and new materials) if it wants to maintain military technological superiority—especially at an affordable price.

Semiconductor chips are an example. On all new cars, a small engine-control computer is hard-mounted directly to the engine block. It sees environments that meet or exceed all military specifications. Today, comparable semiconductors are often used by the military and the commercial world; yet the commercial item is more than an order-of-magnitude cheaper, more than an order-of-magnitude more reliable, and delivers 2 to 3 years more advanced performance than the comparable military part. The reason is obvious; namely, the commercial quantities produced are so great that the costs can be driven down, the reliability driven up, and the performance continuously improved. In fact, such improvements are the only way a commercial supplier can remain competitive.

Additionally, while the commercial manufacturing sector formerly applied a mass production model (where the idea was to reduce costs by producing large quantities of the same item), now world-class commercial firms are increasingly adopting "flexible" techniques in which a wide variety of different products are produced on the same line—yet at low costs. This approach ideally lends itself to using a common production line for small quantities of defense-unique items along with large quantities of a variety of commercial items. Picture, for example, a defense electronic warfare system being built (with rugged commercial parts) on the same line as a variety of commercial electronic boxes, where the robots that insert the electronic parts are programmed in a different fashion for each end-item produced. This same approach is equally applicable to items that are not as obviously related. For example, the same rotary forge used to build cannons can be used to build railroad freight car axles. There are many other examples where the production processes are similar even though the end products themselves are significantly different.

Given these developments, the DOD must increasingly draw on the commercial industrial base to maintain technological superiority—and to achieve this in an affordable fashion. The issue has nothing to do with "industrial policy", as some would suggest; rather, it is one of removing the barriers that currently exist to integration of the commercial and military industrial bases, and of creating proper incentives for firms that are in the commercial world to want to do defense business, as well as for firms that are currently in the defense business to diversify into related commercial areas. Essentially, removing the current, Government-created barriers and disincentives to the operation of free-market forces.

Unfortunately, the trends in recent years have actually been in the opposite direction. More and more world-class commercial firms are refusing to do defense business (for example Hewlett Packard will not take defense R&D contracts because of the burdensome terms and conditions) and many other world-class firms are simply selling off their defense divisions because of the declining market and unattractiveness of doing business with the DOD. In the same way, the increased regulatory burdens particularly in the second half of the 1980s) have created strong disincentives for firms that were previously integrated. As a result, they have separated their commercial and military activities (for example, Boeing divided their commercial and military transport aircraft business because of defense cost accounting requirements).

Unique government oversight requirements, unique procurement practices, and unique military specifications are the answers given by world-class corporations (such as Motorola, Boeing, IBM, etc.) when asked why they have separated their commercial and military businesses. These issues are now being addressed aggressively by the Department of Defense (Under Secretary Perry's personal leadership) and by the Congress' initial acquisition reform legislation of 1994. However, *much more needs to be done to continue to remove the barriers to commercial/military integration.* For example, while the Federal Acquisition Streamlining Act of 1994 is a significant step forward in allowing the Government to buy commercial (and modified commercial) items, it does not address the major issue—for the Department of Defense—of allowing the acquisition of defense-unique items from commercial facilities (using best commercial buying practices). This is where the largest potential cost savings can be realized (beginning with subcontractors and parts suppliers).

Additionally, solely taking steps toward removing the barriers—an effort which is likely to take at least 3-5 years—for completion—is not sufficient. It must be accompanied by the creation of incentives that would encourage world-class commercial corporations to devote some of their energy to defense-unique products, as well as to encourage defense firms to diversify into related commercial businesses in order to absorb their current high overheads. Thus, for success, the required shift to commercial/military industrial integration requires a two-pronged approach: both the removal of the barriers and the creation of incentives.

To see how such incentives might be created, consider the example of DOD's need for advanced gallium arsenide semiconductors in next-generation military radars. Rather than writing a requirement for these devices based solely on advanced military performance needs and the use of full military specifications and procurement procedures, DOD's Advanced Research Projects Agency (ARPA) pursued these microwave monolithic integrated circuits (MIMIC) using a performance-based specification (thus, not giving up any of the military requirements or environmental capabilities) yet complementing this with a statement of the need for low-cost, high-reliability parts and waiving all of the standard military specification and procurement requirements. The effect of these policy changes was to encourage commercial semiconductor suppliers to bid on these DOD R&D contracts. The successful MIMIC program resulted in a number of commercial firms now building these gallium arsenide devices in sufficient volume to provide low cost and high reliability. By utilizing flexible manufacturing, they can supply the few high-end parts that are required for DOD needs along with the large volume of commercial parts required for such areas as automobile collision avoidance radars, toll collection systems, satellite communication systems, and air traffic control signal processing. Through this "dual-use" of a production line (for both military and commercial applications), the DOD is able—to achieve state-of-the-art capability and at dramatically lower costs than would otherwise be accessible to it.

Without such defense investments, world-class commercial suppliers would simply not develop products that the DOD needs for its 21st century weapon systems. Therefore, the DOD investment is a necessary stimulant. Obviously, U.S. commercial industry also gains because (as in the example of the MIMIC products noted above), the use of the defense R&D dollars places them in an international leadership position.

For some programs, such as the ARPA Technology Reinvestment Project (TRP), it is realistic for the industry to also invest some of their own money—to cost-share with the DOD. The idea is to stimulate industry investment and interest in technologies that are required for the DOD in the future, but for which (without the added incentive) commercial firms are unlikely to show an interest. Here, for every Federal dollar invested, it has been matched by $1.33 of non-Federal funds. Some examples of TRP investments that have promising application for both defense and the commercial world include: low-cost night vision devices, high-density data storage devices, battlefield casualty treatment, affordable composite aircraft structures, and detection of chemical and biological agents. It is obvious that each of these is critical to 21st century warfare needs—as well as having a high payoff in the commercial world. It is also clear that if America's industry is not encouraged to move out in these defense areas, they may lose a leadership position and the DOD will be forced to buy this equipment from off-shore sources.

As the defense acquisition budget declines, a significant adverse trend against achieving an efficient and effective 21st century defense industrial base, has been the attempt (by many in the Congress and the military) to maintain a large, and redundant, industrial capability in the public sector. The impact has been that while the private sector defense suppliers have been dramatically downsized, there has been an increasing share of the work brought "in-house"—to the Government depots, arsenals, laboratories, and the pseudo-governmental Federally Funded Research and Development Centers. This "socialization" of the defense industrial base not only eliminates the benefits of technological advancement and lower costs provided by free-market, competitive forces, but also removes tens of billions of dollars of defense business from effective commercial/military integration. *Such trends are no longer affordable or desirable.*

There will, of course, be a few areas in which Government support for assuring a defense industrial capability will still be required; but these should be minimized. Specific criteria must be established and sector-by-sector analyses performed (always with the objective of maximizing the potential from commercial/military integration). The decision to subsidize the continuation of an unneeded weapon's production line, or to subsidize the R&D and procurement of state-of-the-art military equipment which could be purchased offshore, are extremely expensive and difficult choices. They should not be allowed to be easily justified on the simple statement of "maintaining the defense industrial base".

When considering what America needs for its 21st century defense industrial capability three criteria stand out: *state-of-the-art* weapons' performance; assured access to critical technologies; and the *potential* for future production (should it be required). Achieving the first of these (i.e., state-of-the-art capability) requires adequate funding for at least two small and competitive teams of *system's engineers* in each major weapons area—designing, integrating, manufacturing, and testing low cost, fieldable, producible, and supportable prototypes of next generation systems. Here, one of the two (competitive) teams could be in an ally's industry. Also, the overwhelming share of the subsystems, parts, material, etc. for these future weapons should come from commercial sources; and (in many cases) even the system design teams can come from within commercial firms.

The second requirement (i.e., assured access) does require autarchy (national self-sufficiency) for all subsystems, parts, etc. The issue here is *vulnerability*, not foreign dependency. As long as there are multiple sources in multiple countries there is neither military nor economic vulnerability. However, if the number of potential suppliers are reduced to one or two in a single, foreign country, then action may be required to assure invulnerability.

Finally, the third requirement (i.e., the potential for future production) does require that there be any current production underway. Obviously, when there isn't, there must be a clear plan available; but, frequently, this can be satisfied either from the planning associated with the prototype engineering and manufacturing effort, or even by a planned conversion of an existing commercial (flexible) manufacturing operation. The lack of a requirement for current production has very significant implications for the level of government subsidization needed to maintain a viable defense industrial capability. Also, it brings into question the (currently-asserted) need for continued aggressive U.S. foreign sales of advanced weapons systems—for which the United States now supplies 73 percent of the world's arms demands; and which, many believe, does not have positive, long term security implications (for peace and stability in the world). Without the need for foreign weapons sales in order to maintain a defense industrial capability, the United States (as the world's leader) can begin to take the initiative on true multinational arms control agreements.

In summary, America has essentially two choices for its future weapon systems and its supporting industrial base. Either it can continue on the historic trends of buying equipment from an isolated, expensive, and increasingly obsolete defense industrial base—thus yielding extremely expensive weapon systems that take literally decades to develop and produce and are frequently obsolete by the time they are deployed. Or, it can shift to a strategy in which the DOD draws extensively upon a far broader industrial base, which supplies world-class products to both the military and the commercial world. In this latter model, the DOD will have the ability to acquire state-of-the-art weapon systems in sufficient quantities to be militarily effective (because of their far lower costs). To achieve this latter alternative, significant efforts must be made to remove the current barriers to commercial/military integration (in terms of unique cost accounting, procurement, and military specifications) and to create, simultaneously, incentives for industrial integration. The choice is obvious. The effort will, however, be difficult and certainly will require the strong support of both the Congress and the administration.

Senator KEMPTHORNE. Dr. Gansler, thank you very much.

Let me do a little role reversal here. Let us assume for just a moment that we are the witnesses. We have just given you our testimony and thoughts, and you are now the Senate panel. Based upon what you already know from your background in dealing with the issue of whether we are taking adequate steps to preserve the industrial base within the constraints of the budget, what proposal would each of you keep to ensure was included in what ultimately goes to the floor of the Senate?

And you have 60 seconds or less to state it. [Laughter.]

Mr. FUQUA. Mr. Chairman, I will take a crack at that.

Senator KEMPTHORNE. Senator Fuqua. [Laughter.]

Mr. FUQUA. Gee, I have never been called that.

As I mentioned in the testimony, what we have is a big Cold War infrastructure. And if you look at the O&M budget, it is almost flat. It may be coming down a little bit, but basically it is flat.

The decline of the procurement budget going down 71 percent has had a dramatic impact on the industrial base. If that continues, as I said in my prepared remarks, we are now expending money for the present and not looking to the future.

It is so critical what you do today or what we do today for the future of the country. If that continues, if the O&M budget continues at a flat level, or basically flat, and the procurement budget declines, at some point they will cross, and the warfighter will not have anything to fight with in the future. It is a very critical situation.

I think the leadership in the Senate, and in Congress for that matter, must take a real hard look at where we are going in the future—not today. Even the $25 billion that the President—and I am running over my minute——

Senator KEMPTHORNE. It is called a filibuster.

Mr. FUQUA. But the $25 billion that the President added last fall is pushed out to the right. That is 8 years down. I may not be around then, you may not be around then, he may not be around then, and Bill Perry may not be around at that time. So that is sacrificing the future for the present, and I think that is a bad situation.

Senator KEMPTHORNE. You are saying the O&M budget must be increased?

Mr. FUQUA. No. I think we have to get infrastructure, we have to get that down in comparison.

Senator KEMPTHORNE. Okay.

Mr. FUQUA. We have a Cold War infrastructure supporting a peacetime military.

Senator KEMPTHORNE. Okay. Good.

Yes, Mr. Rabaut.

Mr. RABAUT. To add to that, I would agree. We need another BRAC. We need another one. It has not been aggressive enough. And that is how you get that infrastructure that Don Fuqua is talking about out.

Number two, I would be even more aggressive in acquisition reform. Those two areas—and Secretary Kaminski summarizes it very, very well—those two areas are the key areas for freeing up the funds for modernization. And if those are not executed well, the private industry cannot help you.

We talk a lot about this concern about the private industry—the reason, in my opinion, you have not heard more screaming from the private industry is because the private industry is going away rapidly. And the reason it is going away is two: the government is not voting in the private industry with dollars, and it is a free market system; and, number two, the economy is very healthy. So people leave the defense industry and there are options out there.

You couple that with the socialization of the industry—i.e., maintaining a Cold War base in the public sector—and some day there will not be a private industry to support the defense industry.

Senator KEMPTHORNE. All right. Dr. Gansler.

Dr. GANSLER. I had written down the same two points essentially. I would have started with the fact that you have to be much more aggressive in terms of what is called procurement reform. Basically, it is removing the barriers to a restructuring, a total transformation, if you will, of the defense industrial base. There the Congress can play a significant role particularly in the cost accounting arena and in the procurement side; the DOD can cover the rest through regulatory change.

Second, once the barriers are removed, is trying to achieve a more efficient and effective future defense industrial base. I would emphasize that, rather than maintaining the current one; and here the emphasis must be on next-generation types of technologies, that we have to assure ourselves we have the capability for doing.

I would argue that these should be dominated by the private sector. And I do agree that a major barrier to that right now is the Congress' requiring that we maintain the redundant public sector.

Senator KEMPTHORNE. Okay. Good. I appreciate your responses.

Is there a need for a defense export loan guarantee program?

Mr. FUQUA. Yes.

Senator KEMPTHORNE. Mr. Fuqua, why?

Mr. FUQUA. Yes. Well, I included that in my prepared statement, and I did not elaborate on it in my shortened version. Most of our competitor countries have a loan guarantee program for defense exporters. We do not. That, and also recoupment fees, are two very, very important areas that will level the playing field. And what we are talking about, Senator, you were very supportive of it in previous year.

We are talking about selling to our friends. We are not talking about selling to people such as dictators in Third World countries that have very bad public records. We are talking about the allies in NATO, and countries like Australia and New Zealand—very reliable people. And I do not think it brings a point up that we will be engaged in any hostilities with those countries.

Sometimes they may want to fund this over a period of time of the usability of that product, rather than paying for it at one time, like some of our wealthier customers do.

Thank you for your help.

Senator KEMPTHORNE. Okay. Dr. Gansler.

Dr. GANSLER. First of all, I would like to have a defense industrial base in the future that is not dependent upon foreign military sales for its sole existence or its justification. That does not say that we will not have foreign military sales, but I would much prefer that we not be so aggressive as we have been in trying to encourage it. I think that the security implications—as required by law—the law does not allow you to do foreign military sales for economic reasons; it requires that it be for national security reasons.

I personally wonder if the long-term national security of the world is enhanced by the amount of first-class weapon systems that we are now selling worldwide.

The United States already has 73 percent of the new orders for last year. And I really wonder how many more incentives we need; rather than some incentives for trying to control the flood of arms around the world, and to encourage instead our defense industry to begin the transformation which is absolutely essential.

So I am not suggesting that we should not have any of the current provisions, because it is a transition period. What scares me is that many of those incentives may prolong that transition period dramatically. And I would rather encourage, one way or another, the defense firms to achieve the necessary diversification and integration, rather than encouraging them to continue to flood the world with arms.

Senator KEMPTHORNE. Mr. Rabaut, any comment?

Mr. RABAUT. I would only comment that from a point of view of loan guarantees, I come at it more from a national security point of view. I think that the Secretary of Defense should have that as one of the arms in his arsenal, in terms of where he wants to help another nation out for the national defense of the United States, more than from a business base.

Because, as Dr. Gansler points out, you are not going to be able to maintain a defense base based on overseas sales.

Dr. GANSLER. I might point out, obviously, that that is a shrinking market, and we have already got three-quarters of it.

Senator KEMPTHORNE. Right.

Dr. GANSLER. It is not a great place to look for business.

Senator KEMPTHORNE. All right. Thank you very much. Senator Bingaman.

Senator BINGAMAN. Thank you very much.

Dr. Gansler, you talked about incentives for industrial integration. The technology Reinvestment Program (TRP), is a program which we put together, thinking that it would be an incentive for integration and getting more firms interested in activities that would have a benefit to the defense needs of the country.

Is that what you have in mind, or are there other things that we ought to be doing to promote industrial integration, as you are using that phrase?

Dr. GANSLER. I think that TRP is a good example of one type of program for which we created an incentive for commercial firms and defense firms to get together, for commercial firms to show some interest in doing defense business.

My fear, of course, is that these world-class companies will not even want to do business with us. There are other incentives we could create, such as rewarding R&D with profit, such as trying to remove the current impediments to having integrated facilities in a commercial firm that would like to supply to the Department of Defense. World-class companies like Hewlett-Packard will not do defense R&D simply because of the barriers that are now created to doing R&D. And that is not in the Defense Department's interest.

I would like to see us sit down and create a variety of incentives; one of which I thought, the TRP, was heading in the right direction to try and do some of that. I do not think it all has to be cost shared. When it makes sense, it should be cost shared.

I think probably the bigger incentives for industry are not by giving them a small contract of this sort. I think the much bigger incentives to commercial firms coming in or to defense firms diversifying have to do with the regulatory and legislative oversight barriers.

Senator BINGAMAN. Let me just ask this. I am sympathetic to this repeated call for us to be more aggressive in pursuing procurement reform. I just point out that most of the procurement reform that has occurred since I have been here has been initiated here. It has not come out of DOD.

Is there anything floating around out there this year? I mean we are going to markup a bill here in another 6 or 8 weeks. Is there something we ought to put in the defense authorization bill this year that you believe would be a significant contribution to procurement reform, any of you?

Mr. FUQUA. Well, Senator, there is a new acquisition reform proposal up here which industry supports. And we would certainly hope that it would be favorable.

I would like to give you credit, because it was the Section 800 panel that really initiated the most recent 1994 acquisition reform. And this is a further extension of that. So I would like to say that that is absolutely crucial.

It will still not solve all the problems, but it is certainly a major step in the right direction. And the implementation of the current one is very important, too—that it carries out the congressional intent.

Senator BINGAMAN. Mr. Rabaut.

Mr. RABAUT. I really do not have anything to add to that.

Senator BINGAMAN. Okay.

Dr. GANSLER. The current rule was geared toward the commercial procurements. The follow-on is still primarily geared toward commercial and commercial-modified.

I think if we wanted to look into what are the things that could be legislated that create barriers currently to, say, Motorola combining its commercial and military or Boeing combining its commercial and military, the first thing they list is in the cost accounting area. And that still is largely under the Congress, although the DOD has been implementing regulations that go even beyond the intent of the Congress.

I would argue that that is one area you might want to look into—the application of the cost accounting barriers.

There were, of course, other barriers that were listed, in terms of the procurement set-asides and things like that, that I think the Congress could address. And, last, I would go back to the point that all three of us raised, which is that Congress could create incentives for civil/military integration through removal of some of the mandated public sector laws.

Senator BINGAMAN. I have an article here that is from the Albuquerque Journal I guess. Maybe it came from the Los Angeles Times. Yes, it did.

It is called "Defense Fraud Booming. Greed escalating as budgets shrink." I do not know if this is just an aberration, this kind of a report at this stage in our Nation's history, but how do we go forward with changing these cost accounting standards, get the political support to do that, and bring about reform in that area, when we have these kinds of articles continuing to be written about fraud in the procurement process?

Dr. GANSLER. Most of the examples that were given—and certainly in the mid-eighties, when we had all of the scandals—were actually on commercial-like items. And what the public cannot understand is why they have to pay $12 for a hammer and the DOD pays $500 for a hammer, when all the costs are audited. In other words, we have full accounting of these ridiculously high costs.

The alternative, which is to use the free market to actually buy at the price that the market sells for, I do not think the public would be so upset about. I think if we could convince people that in fact we had a market going and we could show them that the prices were comparable for market prices, we would not have those kind of headlines. Because they are truly abuses, when you pay $500 for something that should be $12.

Senator BINGAMAN. One of the things which, Dr. Gansler, you cite in your testimony—you have these three requirements. The third requirement is maintaining the potential for future production. How do you believe the Department should maintain its long view so that it knows what it will want produced? And part of the need here is to maintain the capability to produce something which it may not have off the production line for 15 or 20 or 30 years, maybe.

How does it maintain that forward view for that long a period?

Dr. GANSLER. In many cases, something that for example you are now building in a prototype form, such as a next-generation tank that might have a ceramic engine and composite armor, which is not one we are now building, when you are designing that, you want to consider how that could be built and where it could be built. And that is the integrated product and process that you would worry about.

Could it be built, for example, in a commercial facility? The Japanese are building the military FSX and the commercial 777 on the same metal cutting and composite machines, so that if they wanted to build FSX in quantity, they could do it by cutting back on 777's.

I think in many cases, the DOD could do that if we planned on it. We should worry about the potential for doing it, as contrasted to having to have something in production, in order to be able to do it.

Senator BINGAMAN. Thank you very much.

Thank you, Mr. Chairman.

Senator KEMPTHORNE. Thank you, Senator Bingaman.

Mr. Rabaut, during the defense buildup of the 1980s, multi-year procurement was revived as a means of acquiring major systems for reduced cost. During that period, multi-year contracts were based on the assumption that we would have a stable requirement for a given weapon system over the long term.

None of those assumptions seem to hold true in today's budget environment. In your statement, you recommend expanded use of multi-year contracts.

My question is, how do we justify that in this time of uncertain budgets and low levels of modernization funding?

Mr. RABAUT. Well, first of all, in the past, when you thought about a multi-year, you thought about a multi-year for one specific system. It might be for an F–16. It might be for a Bradley fighting vehicle.

What you see in these consolidations that have gone on is that surviving firms will have a number of products that run across the same machinery, that use the same engineers, that use the same manufacturing facilities, and so on—much like Dr. Gansler was talking about, in terms of having flexible machinery.

So on any particular system that that contractor may have, there may be great uncertainty over the next 3 or 4 years. But if you combine five or six systems together, that basically use the same manufacturing, engineering, industrial base, then a multi-year could be viewed to cover all those systems and allow the Department of Defense to choose what mix of systems they would like to have during that period of time.

In doing that, then you can stabilize your labor force. You can stabilize your vendor base, and so on, if you manage your subcontractor base to also be flexible. That is a theme we have heard several times today, and it is very important.

That is the first way a multi-year can be used in this changed environment.

The second way is, in some cases, you have a program—an example of one is the armored gun system, where the requirements are 200 or 210, and that stretches over 2½ years. Why not just go with a multi-year, and buy out the system so that you can save the funding by grouping the buys, so that you can buy all the engines together and get a decent lot run for that, or you can buy—that does have ceramic armor—you can go ahead and do that, and so on?

So those are the two somewhat different approaches than you have seen in the past on multi-years.

Senator KEMPTHORNE. All right. Thank you.

Mr. Fuqua, you recite in your testimony a number of statistics laying out the dramatic shrinkage of the aerospace industry over the last 10 years. Are there specific R&D or manufacturing capabilities that we have lost as a result of the reductions in the size of the industry? And how much insight does your association have into the issue of lost capabilities or capabilities that may be at risk in the near future?

Mr. FUQUA. Well, as I also stated, it has been estimated that we have lost three out of every four subcontractors in the supplier tier.

What generally happens when you lose that capability is that the company has to move it in-house and try to develop it itself. I do not have the specifics of some of that. I think Tom might have some as it relates to their companies. I will try to get some for you, for the record, Mr. Chairman.

Senator KEMPTHORNE. All right.

[The information follows:]

EXAMPLES OF SUPPLIER AVAILABILITY IN A DOWNSIZING ENVIRONMENT

E-Systems, Inc.:

A circuit card supplier to one of E-Systems' divisions had 70 cards remaining in stock. The supplier saw no future demand and decided to liquidate the items. The division made a speculative buy of all supplier stock at that time. Subsequent customer requirements have nearly exhausted the remaining inventory. A new radio requirement cannot be supported with the existing stock; thus, a new board must be designed. The net impact of this scenario is a significantly increased cost and a lengthened delivery schedule, plus logistics support problems for units already in the field.

Rockwell International Corp.:

A company has been the supplier of precision machined parts for the Hellfire Missile Program for the past 10 years. After the completion of the Hellfire "F" model, which was so effective in the destruction of the Iraq army during the Gulf war, Rockwell had no additional high volume contracts to award. Subsequently, the company began to reduce their skill machinist's staff, and began directing their efforts more toward the commercial market. As a result of the downsizing in defense contracts, Rockwell has had only small quantity miscellaneous proposals to send to the company. Because of these small quantities, the company either does not bid, or their price is not competitive.

Two years ago, a small precision machine facility made a decision to abandon the defense contract world. Their decision was due to the extremely competitive nature of the defense primary contractors during a time of shrinking defense business, as well as the burden of trying to maintain a staff of skilled machinists, quality control, and clerical personnel qualified to interpret and administer all the Government requirements that came along with each and every order. The company was at the point of filing for bankruptcy when it decided to get out of the defense business altogether. Since their decision to change to the commercial marketplace, the company has been able to turn their company around and are now a stable small machining business in the commercial marketplace with a stable work force. Unfortunately, Rockwell is no longer able to do defense business with this company.

A specially-made "lift truck" is needed for the B–1B program to lift bombs and other ordinance under the B–1 into the bomb bay. The supplier who previously produced these items no longer wishes to produce the particular model that the Air Force bought from them since there is no market for that item. The producer has decided to pursue other customer for similar items with different utilizations. Rockwell is still investigating whether it would be prudent for them to either buy the plans for the vehicle and seek out another producer, or merely obtain a license to produce it.

Vought Aircraft (Northrop Grumman):

A supplier ceased production of nickel-coated graphite fabric for the B–2 bomber program on June 22, 1994. Since then, the plating line has suffered substantial deterioration. Vought will have to find another supplier and have the product requalified.

Due to reduced opportunities in the aerospace industry, a supplier of machined parts for the C–17 program has decided to transition its business base to other markets. This move has considerably reduced market capacity for this product. Vought will develop a new source. Market capacity for this product cannot support much growth and will be impacted by work being off-loaded by larger companies.

TRW Space & Electronics Group:

TRW's business has been affected by the acquisition of a supplier of low-noise amplifiers and voltage-controlled oscillators by another company. After the acquisition, this supplier elected to get out of the space flight hardware business.

Several suppliers are refusing to build to TRW's specifications and insisting that we buy their standard products. TRW must then perform the additional test and screening needed to upgrade the part.

Lockheed Martin Space & Missiles Co., Inc:

On February 15, 1995, a supplier for Lockheed Martin notified its customers of its plans to close its production facilities due to financial losses resulting from the shrinking defense market and the lack of financial reserves to maintain an idle facility. The supplier offered to manufacture one last production run for the industry providing the order was placed by March 31, 1995. The company is a sole-source supplier of a carbon microsphere utilized in propulsion applications. Lockheed Martin was able to place the final order before the deadline, however it necessitated the use of Lockheed Martin's own funding (pre-contractual) in order to ensure the protection of the Trident II (D5) program.

Alliant Techsystems Inc.:

A company was developed as a source of supply of rubber insulation for the Titan and Delta II programs. In February of 1992, this company announced that they would no longer process custom rubber formulations. The main reason was to dedicate their facility to the tire retreading and repair products on the commercial side of the business. This left Alliant with only one source of supply for qualified rubber, which not only adds risk to the supply of insulation materials in this case, but also eliminated the opportunity to competitively bid the material. The problem is twofold: First, Alliant would end up with only one source of qualified rubber unless it requalifies another supplier, which is very costly. Second, Alliant would remain without competition for a future procurement effort. This directly affects their procurement system, as it is one of the main elements of a Contractor's Procurement System Review. Without competition, a large order can require 100 or more hours for documentation, cost analysis, etc.

Sundstrand Aerospace:

The major commodities that are now causing concern in the procurement process center around electronics components. With suppliers getting out of of the military components business, sources of supply are getting limited, and in some cases, going away altogether. Sundstrand Aerospace is currently evaluating its options to make lifetime purchases or go to complete redesign in some cases. The shortages in these components go across all programs, both military and commercial. At this time, these are the items that represent the largest impact for Sundstrand.

Texas Instruments:

Several manufacturers have stopped producing military active components due to the fact that their resources can best be spent supporting growing commercial business. If no other sources exist, life-time buys may be required on minimum buys to cover short term needs pending redesign efforts.

Miscellaneous problems with military downsizing are minimum purchase quantities, higher prices, difficulty in getting mature programs to consider redesign or part substitution, working with many small-niche suppliers as opposed to a few strategic or alliance suppliers, suppliers unwilling to commit resources to process improvements of sunset technology, and the associated costs to continue to manage and administrate these situations.

Mr. FUQUA. But, generally, a lot of companies move that type of capability in-house. But there are some very unique talents and supplier base that we are losing, and that companies will develop—either buy a company or have to move it in-house—in order to achieve that.

Maybe Tom has some specifics on that.

Senator KEMPTHORNE. Mr. Rabaut.

Mr. RABAUT. For example, we are in the heavy equipment side of the house. I know that large castings for certain systems you just cannot get those today. The reason that you have not felt it in the Department of Defense is because, in the last few years, there have not been any systems like that purchased.

So, as long as you never need them, you will not feel it. But when it comes around to needing them, you will. I would argue that is true for any program, any system, that has gone out of production in the last few years. Because in the private sector, the capabilities will not be maintained if there is no reason for them to be maintained—i.e., there is nobody buying them.

Now, that does not mean that they all have to be purchased all the time. I mean you can take an approach like Dr. Gansler is talking about—and it is a very valid approach—where really you are modeling, you are simulating an industry, and saying this is where we are going to go in the commercial sector to get it.

But the reason much of that is not going on in the industry right now is that the acquisition approach is so difficult to work through, to use the commercial sector, that you do not take as much advantage of it as you could.

Senator KEMPTHORNE. I would appreciate any member of the panel, on that aspect—the question of how difficult it is, the acquisition process—if you would elaborate in a letter to me, and what remedy you really are suggesting, if you would spell it out for me.

[The information follows:]

UNITED DEFENSE LP,
WORLD HEADQUARTERS,
Arlington, VA, April 21, 1995.

Hon. DIRK KEMPTHORNE,
U.S. Senate,
Washington, DC.

DEAR SENATOR KEMPTHORNE: It was a special privilege for me to testify before the Senate Armed Services Subcommittee on Acquisition and Technology at the March 28 hearing that you chaired.

At the end of the hearing, you invited us to provide any additional thoughts and insight on the defense acquisition process. In that connection, I would offer the following thoughts.

Future military readiness depends upon modernization. Most of us would agree that there is a modernization pause in order to fund near-term readiness. The Department of Defense leadership has assessed this pause as medium risk.

In the period of scarce dollars available for defense spending, modernization can only take place if funds are freed up by acquisition reform and infrastructure reduction. Without savings from these two areas, future modernization will be impossible. While infrastructure reduction is painful in the short term, it must take place in order to guarantee future military readiness. This, along with acquisition reform, could free up the necessary funds for modernization. This approach can work with the dedicated support of leaders like yourself. If it does not happen, however, the repercussion will be severe.

Thank you for the opportunity to provide additional information. I hope you will feel free to contact me if you have additional questions or would like to discuss this matter further.

Sincerely,

THOMAS W. RABAUT,
President and Chief Executive Officer.

Senator KEMPTHORNE. Dr. Gansler, let me ask you this question. You listed three items, the third one being potential for future production. I can see that that is very important. I wonder, in the case of, let us say, a Bradley fighting vehicle or a *Seawolf* submarine, I do not see how you have a switch that you can throw on or off, because those probably really are defense-unique.

So what do you do when you have a defense-unique product and they are saying that somehow you better keep some of those elements in place, because it is not an on-off switch?

Dr. GANSLER. Well, one thing you would certainly want to do anyhow is to be developing the next generation prototype systems someplace in the country, probably at the system level, or at least have the capability of doing that. So if you did that with modern design techniques, you would also have production engineers involved in it. They would be doing the planning of where the production would be done.

I think you would inherently have a production concern built into that system. And in most cases, there will be an opportunity for some integrated activities. I would argue, even in something like an infantry fighting vehicle, that there are opportunities for other things that could be built on similar flexible machines.

In the case of submarines, I would have to look at it in more detail, but I do know that you would want to at least have a next-generation submarine, because submarines are so critical to our future. And so as long as you were doing some design and production in the sense of one—which is the quantity for that prototype—you would have the capability to expand that.

Now, it is important to point out, you are not going to surge on submarines if we go to war. I mean that just takes too long. You would not surge on tanks and you would not surge on aircraft, and you would not surge on most of these big equipment. You would surge on the expendables, the spare parts, and the munitions.

Those capabilities, you want to have the production much more readily available. When and if we had to reconstitute a defense industrial base, you probably could build the factories, in many cases, as fast as you could design and build the equipment.

So, you have to look at what type of production planning you want to worry about. It is the capability and the potential that I think is of most interest to us; that we do not want to lose that potential—the skill mix, in some cases, of the work force that are critical skill mixes. And that I think you could do with a prototype.

Senator KEMPTHORNE. All right. Thank you very much. Senator Bingaman.

Senator BINGAMAN. That is all I had, Mr. Chairman. I will stop with that.

Senator KEMPTHORNE. All right. I want to thank the panel. It has been a very, very interesting and insightful discussion. And I think on many of the comments that you have made, Senator Bingaman and I would enjoy being able to pursue those. This could go on for quite some time. We appreciate that.

Again, I hope you will take us up on the invitation to provide us additional thoughts and insight that might help us in crafting a proposal for the future.

With that, the hearing is adjourned.

[Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR DIRK KEMPTHORNE

INDUSTRIAL AND TECHNOLOGICAL CAPABILITIES

Senator KEMPTHORNE. Mr. Gotbaum, one of your stated objectives is to take actions to preserve essential defense unique capabilities. You are clear in your statement that we need to distinguish between capabilities and companies. That raises an important issue since technology and industrial base capabilities are the unit of analysis in your proposed rewrite of chapter 148.

a. What do you mean by "capability?"

b. Is it a specific manufacturing process?

c. Are you focusing on plant capacity? Systems integration expertise?

d. Is industrial base capability synonymous with all activities underway in a given company or corporate site?

e. How do you define and measure capability in the case of research and development?

Mr. GOTBAUM. Our objective is to ensure that essential capabilities will be available when needed, not to preserve every supplier. A given capability may be available from more than one supplier. Therefore, we must separate capabilities from companies so that the full range of alternatives available to preserve the capability can be identified and objectively evaluated.

a. An industrial capability is a skill, facility, process, or technology needed to design, develop, produce, repair, or maintain products necessary to meet defense requirements.

b. As described above, a capability could be a specific manufacturing process—for example, one used to produce extremely large forgings.

c. We do focus on capacity issues in our analyses. A capability to produce specific items of ammunition would not be adequate to meet defense needs if the required quantities of that ammunition could not be produced when needed. When the Department performs an evaluation to determine if a specific capability is adequate to meet defense requirements, all attributes of that capability are considered. "Skills" necessary to meet defense requirements, such as systems integration expertise, nuclear engineering, or specialized welding are also included.

d. Yes, all activities at a given company or corporate site represent capabilities which could be used to meet defense requirements. However, not all of the capabilities resident in a site may be truly "essential" to defense, or "endangered" due to reduced DOD procurements. Most of the capabilities probably reside in other company or corporate sites. Additionally, if 'lost" due to declining defense procurements, many of the capabilities likely could be cost-effectively reconstituted in sufficient time to meet new Department requirements. In such cases, DOD actions to sustain the capability would not be appropriate. This is why the Department is focusing its review on endangered capabilities for which: (1) there is a continuing defense requirement; (2) there are no acceptable substitutes; and (3) Department action is necessary to ensure continued viability.

e. The Department's mission includes the development and application of leading edge, militarily important technologies. Therefore, as stated above, technologies (and the research and development activities associated with them) necessary to meet military needs are included within the Department's definition of capabilities. When determining if a required technological capability is adequate, the Department evaluates the extent to which the technology is funded. Additionally, the Department determines if declining defense requirements could erode the intellectual skills, specialized facilities, and key equipment required to sustain necessary future technology development and application.

INDUSTRIAL BASE DATA COLLECTION

Senator KEMPTHORNE. Mr. Gotbaum, describe your industrial base data collection process in more detail.

a. How much in human and fiscal resources are you devoting to this effort?

b. How do you intend to expand this effort over time?

c. When do you intend to have the collection system fully up and running?

d. How broadly across the industrial and technology base will you be collecting the data?

e. How deeply below the prime contractor will the data collection routinely go?

f. What are the basic data points that will serve as the building blocks of the effort?

g. How do you intend to derive capabilities from the data?

Mr. GOTBAUM. The proposed collection has been specifically designed to replace four separate Department of Defense information collections. The proposed process includes annual development of an integrated Department of Defense data collection plan in which all recurring Department industrial facilities-related information requirements are identified and consolidated. All information available from Department of Defense organizations will then be evaluated and incorporated, as applicable, into the data collection before requesting additional information from privately-owned companies. Individual industrial facilities specifically identified as being of interest to Department of Defense organizations will be contacted by a single Department representative, required information collected by that single representative, and the information then made consistently available to authorized Department users.

The data is to be updated as necessary to maintain currency. Input from Department representatives will be used to identify information whose currency is in question. Companies will not be asked to provide additional or updated information if

Department representatives determine the information is no longer needed, or believe needed available information is still current. Information of this type has been, and will be, considered "Business Sensitive." As such, individual company information will be appropriately protected, made available only to authorized users, and is not subject to public disclosure under the Freedom of Information Act, unless authorized by the company.

a. We estimate the Department will expend approximately 75 man years annually to collect the information. We have made no estimates on the time to analyze the information to support specific assessments. Other than personnel costs, no additional funding requirements have been identified.

b. There are no plans to expand this effort. The process has been designed to meet all anticipated recurring Department needs for industrial facility-related information. There are plans to automate the system to improve effectiveness and efficiency. Additionally, the Department plans to evaluate the process after 1 year to ensure it is functioning cost effectively, and creating the minimum burden possible on contractors.

c. We anticipate Office of Management and Budget approval of the data collection within 3 months. We anticipate the process will be in place in November 1995, and information will be collected beginning in February 1996. In the interim, the Department is using existing, albeit not as efficient, collection processes.

d. We estimate the Department will be collecting information from a maximum of 7,500 contractors, annually.

e. The Department will go as deep into the subtiers as necessary to collect required information. The process is not intended to produce an "encyclopedia" of industrial information. Rather it is focused on collecting information to meet specifically identified analytical needs—including data resident in the subtier. Selection criteria for subcontractors of interest include: (1) those which supply essential defense products with relatively long-lead times; (2) those that are single, sole, or foreign sources; and (3) those whose products are facing technical obsolescence and which are becoming increasingly hard to acquire or maintain.

f. The Department has categorized information of interest into broad groups: facility description, business profile, labor, material issues, facility production capabilities, technology, customer base, and manufactured items. Not all contractors queried will be asked to respond to each information category. Information requested of a particular contractor will be limited to that necessary to perform specific analyses.

g. The raw information collected will be evaluated to identify key producers, the projected business base of those producers, facility capacity and utilization, industrial or technological capabilities believed to be essential to meet defense needs, and other issues of interest. All the information will be compared with Department requirements to identify potential shortfalls.

Senator KEMPTHORNE. Lower tier vendors have traditionally complained that defense export sales involving offset agreements have had strong negative impact on the defense industrial base over time. There is evidence that customer countries are becoming much more aggressive in the types of offset agreements they are requiring as a condition of an arms sale.

Is the situation with offsets now qualitatively different than in the 1980s? Is the impact of current offset agreements becoming more serious?

Mr. RABAUT. My response is necessarily limited to United Defense LP (FMC/BMY) foreign sales, therefore focuses on tracked combat vehicles.

Our experience is that each sale is quite different as to degree and type of offset. Some FMS and even direct dollar sales involve none at all. Other countries insist on some form of offset and/or coproduction.

We do *not* find the offset situation qualitatively different than in the 1980s. That was a decade of growing demands for offsets which appear no more onerous now in the mid-1990s. Similarly, we do not believe the impact of current offset agreements is becoming more serious for our vendor base, except for the aspect of a rapidly shrinking defense supplier base where any additional business is a great help.

There are various kinds of "offsets", ranging from major coproduction all the way to purchase of customer country commodities (oil, aluminum, oranges) which have no relation to our vendor base.

Obviously, to the degree that the customer country is given a work share which involves subsystems or components of our systems, a certain amount of work is denied our vendor base. However, the customer country is not permitted to sell back into the U.S. defense procurement system unless he fully qualifies as a supplier through the normal U.S. system in competition with U.S. suppliers.

In most sales involving offsets or coproduction, our experience is that we are up against competent European and sometimes Asian competition who are very adept at offset arrangements. Therefore, it becomes a matter of meeting the buyer's demands or losing the total sale.

Senator KEMPTHORNE. In your statement you have laid out a detailed approach for incorporating industrial base considerations in the defense budget process.

In your model of industrial base planning, how critical is the need for a detailed understanding of the processes involved at each stage of producing a system or subsystem? What should be the building blocks for measuring capabilities?

Mr. RABAUT. Tracked combat vehicle systems, as do other defense systems, require full service prime contractors who are accomplished system integrators.

A "full service" prime contractor should have the following capabilities:

- Technology development and application to his type systems.
- System design and development, both for current system upgrades and for new systems.
- System production. In the current and future environment, this means *lean* production of high quality systems in smaller quantities, at reasonable prices.
- Management of a viable supplier/vendor base.
- Follow-on contractor logistical support, both in peacetime and wartime, to include in the combat theater.
- System Technical Support, in the form of maintenance of technical data packages, manufacturing introduction, processing of engineering change proposals, creation of modification work orders, maintenance of technical publications, etc.
- Marketing for foreign sales.
- All of the above in a customer-oriented team environment.

It is critical that Government agencies concerned about the industrial base understand the process involved at each stage of producing a system or major subsystem. Our tracked combat vehicle customers understand this very well.

The capabilities listed above are all "building blocks", which only a very few companies have in the rapidly shrinking defense market. A certain level of research, development, and production business is required to support the full service capability needed to provide the warfighter his modernized combat systems. As time goes on, each segment of the industrial base is likely, from natural causes, to shrink to one or two prime contractors.

Measurement of these "building block" capabilities is a straightforward process based on proven performance, which is constantly being measured and validated on current programs. A measurement is taken in head-to-head competitions, but an accurate assessment by the customer is also taken in sole source environments.

The other aspect of the process which requires detailed understanding is the type and availability of annual funding available in each critical defense industrial base sector for each major program/platform. Different "colors" of money are normally available for a particular Combat System, to include operation and maintenance, research and development, and procurement. *Most Efficient* use of the total funds available to support warfighter needs, while at the same time maintaining a minimum industrial base capability, should be our goal.

Senator KEMPTHORNE. Lower tier vendors have traditionally complained that defense export sales involving offset agreements have had a strong negative impact on the defense industrial base over time. There is evidence that customer countries are becoming much more aggressive in the types of offset agreements they are requiring as a condition of an arms sale. Is the situation with offsets now qualitatively different than in the 1980s? Is the impact of current offset agreements becoming more serious? Is this an area we should consider for further review and action?

Mr. GANSLER. During the late 1980s and early 1990s, the market for foreign military sales shrunk dramatically while the number of suppliers of sophisticated conventional and military equipment increased equally dramatically. Not only were there more new suppliers, but the traditional suppliers were cutting back on their forces and had lots of front-line equipment available for "bargain" prices. Additionally, many countries have been forced to shift more heavily to foreign military sales in order to support the maintenance of their defense industrial base. (The United States, of course, being an outstanding example of this.) Thus, the world of foreign military sales has clearly become a "buyers market". Not only are the buyers asking for low prices and firstline technology, but they are also demanding coproduction, technology transfer, and, particularly, offsets—which often exceed 100 percent of the purchase price. In the case of such offsets, the prime weapon system contractor is enthusiastic about making the sale—at any cost—so he is often willing to accept agreements for offsets of, for example, 150 percent of the selling price—where these offsets can be at the lower tiers of the defense industry or even in other goods and services unrelated to the products being purchased. In such situations, while it is clear that the prime contractor gains from the foreign military sale, it is far less clear that the Nation gains.

The fact that the U.S. Government (in both the executive and legislative branches) have, in recent years, been encouraging foreign military sales does not in any way address either the potential economic impact associated with the technology transfer, coproduction, and offset agreements; nor does it address the potential long-term national security implications associated with flooding the world with arms. (In 1994 the United States captured 73 percent of the new orders for foreign military sales in the world.) This whole area—of establishing a U.S. policy associated with conventional arms sales that treats the long-term economic and military implications of foreign military sales and, particularly, that associated with offsets—is clearly worthy of further review and action.

Senator **KEMPTHORNE**. In your statement, you advocate allowing the Department of Defense to acquire defense-unique items from commercial facilities. This is a revolutionary concept when compared with the current approach allowing only for use of streamlined acquisition procedures for buying commercial items regardless of the facility where the items may have been manufactured. How would existing law have to be amended to implement what you recommend?

Mr. **GANSLER**. The greatest benefits of civil/military integration to the Department of Defense will come about when production lines, support facilities, and engineering activities are integrated. To a large extent the equipments required by the Department of Defense—in its final configurations—are almost always unique. While frequently commercial parts and, in some cases, subsystems can be utilized, the greatest benefit of the dual-use approach is achieved when a single factory can combine large volume commercial equipment and small volume, highly-specialized, unique defense equipment in the same plant. The obvious advantage associated with overhead absorption from the large volume commercial activities are clear. However, what has not been widely recognized is the fact that with flexible manufacturing operations, the commercial world is, in fact, shifting to a model in which, on the same production line, a wide variety of different products (using similar parts and production processes) are being built. Thus, one could conceive of an electronic warfare box (utilizing ruggedized commercial components) being built on the same line as other commercial electronics boxes by simply changing the program on the tape as the systems are coming down the line. In the same way (as noted in my prepared testimony) one could envision the use of a rotary forge which builds railroad freight car axles and also a few cannons for the military. Obviously, should a crisis require a significant increase in defense capability there is an added advantage to such civil/military plant integration (besides the cost benefits) associated with the capability for rapid production surge under such situations.

When surveys have been done of world-class contractors, asking them why they don't build military and commercial products in the same plant, the data are very clear that their answer is not because of technology differences (in terms of either the product or the production process) but rather the cause is listed as "unique government practices" such as: (1) unique cost accounting and auditing; (2) unique military specifications and standards; and (3) unique Government procurement practices. While the Department of Defense has initiated a vigorous effort at addressing the specs and standards area, the cost accounting and procurement areas will require significant congressional action. In the procurement arena, a number of the required actions (well above and beyond those implemented in the Federal Acquisition Streamlining Act of 1994—which was geared toward commercial item procurement) were identified by the Panel 800 Report; as were a number of the cost accounting and auditing requirements. Clearly, for the latter a totally new way of doing Government business—based on market forces rather than cost-based contracting—is required. Here, the Congress must work closely with the DOD in evolving a new set of practices and procedures; one that will assure public trust while allowing commercial contractors to utilize their current accounting and pricing structures. Interestingly, commercial practices are based upon trying to lower the cost as much as possible while improving the performance of systems. While Government accounting practices are based upon simply providing high visibility into all costs (regardless of whether they are high or low) while achieving the required weapons performance. The difference here is quite striking in that the results achieved in the commercial arena are far better from the buyer's perspective, i.e., higher performance at lower cost; yet this has never been a measure of success in Government procurements (rather, the issue has been providing "visibility").

In summary, if the Congress wants to achieve significant improvements in the efficiency and effectiveness with which it spends the approximately $100 billion per year of defense acquisition resources, it is going to have to shift to a market-based system utilizing best commercial practices, rather than its current "unique" Government practices. There is ample evidence to show that the savings from such a shift will result in tens of billions of dollars of annual cost reductions—with significant improvements in weapons performance and deliveries.

[Whereupon, at 4:09 p.m., the hearing was adjourned.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1996 AND THE FUTURE YEARS DEFENSE PROGRAM

THURSDAY, MARCH 30, 1995

U.S. SENATE,
SUBCOMMITTEE ON ACQUISITION AND TECHNOLOGY,
COMMITTEE ON ARMED SERVICES.
Washington, DC.

CLOSED SESSION

COUNTERPROLIFERATION SUPPORT PROGRAM

The subcommittee met in closed session, pursuant to notice, at 2:17 p.m. in room SR–232A, Russell Senate Office Building, Senator Bob Smith (chairman of the subcommittee) presiding.

Subcommittee members present: Senators Smith (presiding), Thurmond (chairman of the committee), Levin, and Bingaman.

Committee staff members present: Lucia M. Chavez and Jonathan L. Etherton, professional staff members.

Minority staff members present: Christine E. Cowart, special assistant; and John W. Douglass, professional staff member.

Staff assistant present: Kathleen M. Paralusz.

Committee members' assistants present: Thomas L. Lankford, assistant to Senator Smith; Matthew Hay, assistant to Senator Inhofe; Richard W. Fieldhouse, assistant to Senator Levin; Steven A. Wolfe, assistant to Senator Kennedy; and Edward McGaffigan, Jr., assistant to Senator Bingaman.

OPENING STATEMENT OF SENATOR BOB SMITH, CHAIRMAN

Senator SMITH. The committee will come to order. I apologize to the witnesses for being a few minutes late. One too many appointments here today.

The subcommittee meets today to receive testimony on the fiscal year 1996 budget request for the defense counterproliferation support program and future years defense program. We will begin this hearing in closed session at the Top Secret level. I ask the clerk to verify that all congressional staff in attendance have the appropriate clearances.

Ms. PARALUSZ. Yes.

Senator SMITH. Thank you. I ask that the witnesses verify for the record that they are appropriately cleared and that all individuals accompanying them are appropriately cleared.

Dr. SHULER. They are.

Captain GUMBERT. Yes, sir.

Senator SMITH. The record will show all the responses were yes. During this portion of the hearing, the closed portion, we will receive testimony on issues related to the current threat, the situation in Iraq and North Korea, as well as the recent gas attack in Japan. Additionally, we will discuss issues regarding military planning and guidance, as well as operations, that are best discussed in closed session.

I understand that the Department of Defense has asked Dr. Gordon Oehler, the Director of the Nonproliferation Center, to provide the subcommittee with recent intelligence information on the threat in Iraq, North Korea, and Japan.

Our other witnesses are: Dr. Bill Shuler, Deputy Assistant to the Secretary for Counterproliferation, the Office of Assistant to the Secretary for Atomic Energy; Mr. Bill Heiser, Director of Military Assessment and Response, Counterproliferation Policy, Office of the Under Secretary for Policy; and Capt. Ron Gumbert, Assistant Deputy Director for Strategy and Policy, the Joint Staff. We welcome all of you.

Senator Levin, do you have any opening remarks?

Senator LEVIN. I do not have any opening remarks, Mr. Chairman. I believe Senator Bingaman is on his way, so perhaps he could be called on when he arrives. Thank you.

Senator SMITH. Absolutely. The moment he arrives we would be happy to interrupt the witnesses' testimony. Whoever happens to be speaking, finish your remarks, and then we will go to Senator Bingaman for his opening statement.

Do you have a preference who would like to go first here?

Dr. SHULER. Mr. Chairman, if I could suggest, we would like to proceed with Bill Heiser first to provide a brief statement on the Department of Defense's counterproliferation policy.

Senator SMITH. I would just say, we are in closed session here, so any statement that you have will be part of the formal record. If you could be brief in your summary, we do have some questions. We would like to go for about an hour and then start the open session so that the reporters can have access to us for a little while.

Dr. SHULER. Yes, sir. We also have Captain Gumbert who can discuss military initiatives in this area, and I would like to request your permission to have Dr. Oehler join us at the table here, if that is all right with you. Dr. Oehler will fill us in on the threat.

Senator SMITH. Certainly.

Dr. SHULER. With your permission, I would like to ask Mr. Heiser to proceed and outline for us the counterproliferation policy.

STATEMENT OF G. WILLIAM HEISER, DIRECTOR OF MILITARY ASSESSMENT AND RESPONSE, COUNTERPROLIFERATION POLICY, OFFICE OF THE UNDER SECRETARY OF DEFENSE FOR POLICY, DEPARTMENT OF DEFENSE; ACCOMPANIED BY CAPT. RONALD D. GUMBERT, U.S. NAVY, ASSISTANT DEPUTY DIRECTOR FOR STRATEGY AND POLICY, THE JOINT STAFF

Mr. HEISER. Mr. Chairman, it is a pleasure to be with you this afternoon to discuss counterproliferation policy and the program that Dr. Shuler is working on that provides the acquisition support for that policy.

I have provided a copy of what I call key bottom lines to you that I think appears before you now. What I would like to do is just track through this very quickly. If I am spending too much time in an area, please tell me and we will move on to the next page.

Senator SMITH. Try to stick with 5 to 8 minutes, something like that, if you can.

Mr. HEISER. I will do so, sir. The purpose of my presentation is to set the stage for your detailed discussions of how the Department is spending its moneys in the counterproliferation acquisition plan. The first item in this package is the bureaucratic definition of "counterproliferation."

"COUNTERPROLIFERATION"

- Activities of the Department of Defense across the full range of U.S. efforts to combat proliferation, including diplomacy, arms control, export controls, and intelligence collection and analysis, with particular responsibility for assuring that U.S. forces and interests can be protected should they confront an adversary armed with weapons of mass destruction or missiles.

The operative part of this is "activities of the Department of Defense across the full range of U.S. efforts." That includes a whole array of activities outlined in the definition, but from a Defense standpoint we are principally concerned with ensuring that our forces are properly equipped and trained to deal with weapons of mass destruction on the battlefield.

We use a shorthand of "counterproliferation equals prevention plus protection" when we talk about definitions of "counterproliferation" to distinguish it from the term, the historic term, "nonproliferation." But the real bottom line of counterproliferation is we have to treat WMD proliferation as a security threat and not just another diplomatic problem.

Nonetheless, the first priority continues to be prevention of these capabilities. But from the Department of Defense's standpoint, we have to be prepared to deal with the military security issues that arise as a consequence of proliferation.

DoD Preparation = Prevention + Protection

- Prevention and protection are mutually reinforcing.
- Prevention remains our preeminent goal.
- Prevention will not be successful in all cases.
- Must treat proliferation as a security threat, not just a diplomatic problem.

"Counterproliferation" applies unique DoD capabilities to the prevention of WMD proliferation, and the military preparations required to effectively deal with this security threat.

Mr. HEISER. The next chart simply outlines the five constituent elements that describe how we are organized to deal with counterproliferation. There is a policy element. The policy framework is in place.

Protection Aspects of Counterproliferation

- Policy - Policy framework is in place.
- Military Planning - Military Missions and Functions.
- Intelligence Support - DoD augmentation to NPC.
- Acquisition and technology base - Counterproliferation Support Program.
- International Cooperation - NATO deliberations.

Acquiring a Full Range of Military Capabilities to Counter Proliferators Also Reduces the Incentives to Acquire These Weapons

Then military planning: The Chairman has commissioned a missions and functions study which has just been completed and forwarded to the Secretary, the purpose of which is to adjust the missions and functions of the services and the CINCs to implement counterproliferation policy.

Intelligence support: The Department of Defense has augmented the Nonproliferation Center with a total now of 18 personnel to give more support toward meeting the military requirements for intelligence to carry out the counterproliferation policy.

Acquisition and technology base is the area where Dr. Shuler is going to focus momentarily, and you are going to go through the blueprint the Department has for how we believe we should be spending our moneys in the counterproliferation area.

International cooperation: It is clear to all of us that the United States does not face the proliferation problem alone. If we are going to be successful, we have to bring our allies on board as well. And we can discuss, if you wish, the State of NATO deliberations in this regard, and we have also been working with the Japanese.

The next several charts just cover in more detail the points I made in each of those five categories. I think that a real bottom line consideration for the subcommittee, however, lies in the implications for military planning of the WMD threat. I think a principal concern is that WMD proliferation undermines the U.S. power projection strategy. We want to have the capabilities available to us to deal with the WMD threat without having to resort to the use of nuclear weapons.

Policy

- **Secretary Perry directed Joint Staff, Services, and CINCs to plan and program for the threat posed by WMD proliferation.**
- **As Joint Staff, Services, and CINCs wrestle with the counterproliferation challenge, further policy refinements will occur.**

Counterproliferation Policy Key Objectives

- Prevent acquisition of WMD and missile capabilities.
- Roll back proliferation where it has occurred.
- Deter use of WMD and their delivery systems.
- Adapt U.S. military forces and planning to operate against threats posed by WMD and their delivery systems.

Proliferation Danger -- Implications for U.S. Military Planning

- WMD threaten effective use of U.S.'s superior conventional capabilities, for both political and military reasons.
- In any future regional conflict, proliferators might not use WMD against U.S. forces, but U.S. military commanders must assume they will.
- The Defense Counterproliferation Initiative seeks to ensure U.S. forces are equipped and trained to effectively defeat an aggressor armed with WMD.

WMD Proliferation Undermines U.S. Power Projection Strategy

Intelligence

- Intelligence optimized to meet military requirements of protection as well as diplomatic requirements of prevention.
- Military support to the Non-Proliferation Center.

Must Develop a Better Understanding of the Strategic and Operational Personality of Proliferators

Acquisition and Technology Base

- ATSD/AE developed Counterproliferation Support Program in coordination with military authorities.
- Funding provided by Congress for 1995 will address shortfalls in key areas.
  - BW/CW detection and characterization.
  - Hard target characterization and defeat.
  - Paramilitary/terrorist WMD threats.
  - Detect and track WMD shipments at sea.
  - Individual/collective protection and decontamination.

Build Upon Existing Capabilities

International Cooperation

- Promoting the counterproliferation concept within NATO through the Defense Group on Proliferation.
- A three phase workplan
  - Phase I: Assessment of risks.
  - Phase II: Analysis of impact on Alliance capability.
  - Phase III: Analysis of improvements required.
- Exploring common areas of concern and possible cooperation on counterproliferation with like-minded allies in the Pacific theater.
  - Working with Japanese on theater missile defense issues, and technology sharing.

We will not be successful in our counterproliferation effort if we have to rely exclusively on our own nuclear weapons in order to deal with this threat. We have to find a way to supplement that capability with an effective conventional capability. I think you will find that is a primary focus of what Dr. Shuler is going to discuss shortly.

Mr. Chairman, I think that is a sufficient introduction for the discussion we are about to enter into. Unless you have any specific questions, I believe Dr. Shuler could proceed with his blueprint.

Senator SMITH. Let me just see if Senator Bingaman would like to make a comment.

Senator BINGAMAN. No, that is fine. Thank you, Mr. Chairman.

Senator SMITH. Go ahead, Dr. Shuler.

STATEMENT OF DR. WILLIAM B. SHULER, DEPUTY ASSISTANT SECRETARY OF DEFENSE FOR COUNTERPROLIFERATION, OFFICE OF THE ASSISTANT TO THE SECRETARY OF DEFENSE FOR ATOMIC ENERGY, DEPARTMENT OF DEFENSE; ACCOMPANIED BY DR. GORDON OEHLER, THE NONPROLIFERATION CENTER, CENTRAL INTELLIGENCE AGENCY

Dr. SHULER. Yes, thank you, sir. I would like to start by just reviewing briefly the report that we submitted last May that was chaired by Department of Defense Dr. Deutch, that led to where we are now. During that report, when that was done, there were 10 areas identified for the Department of Defense as areas for progress out of a total of about 16 areas that were spread across other agency responsibilities.

The total amount that was suggested to be allocated toward those areas of progress was $400 million per year, and that was all-inclusive of all agencies. Of that amount, about 60 percent, $230 million, was the Department of Defense's responsibility.

Since that time, in the fiscal year 1996 POM, we have $108 million levied against those areas for progress, about half of what was recommended. In part that is due to some reprogramming internally to counterproliferation-related programs, such as MICAD, the communications system for biodetectors which was funded subsequent to that report, and in part it is a reflection of other Department of Defense priorities that the full amount was not funded.

I would also like to point out and thank you for having provided us $60 million in fiscal year 1995 to get a head start. It has been extremely useful and I hope in the short time I have here I can describe to you what we have done with that money.

Before I do that, I would like to just cover briefly how we are coordinating this with the CINCs and with the military, and I am sure Captain Gumbert here will be able to amplify on this if you have questions, and I think he intends to make a short statement with regard to that issue.

As a result of the communications between Dr. Deutch, the Deputy Secretary, and Vice Chairman Owens, there is an agreement that the Joint Requirements Oversight Committee would review the program that we have proposed, next year's Counterproliferation Support Program. The Joint Oversight Committee (JROC) did review it. They scrubbed the priorities, and we are responding to JROC priorities in executing this program.

Those priorities were coordinated with the CINCs. There has been a joint working group set up. We meet with them almost weekly to review their evolving requirements and adjust our program and respond to those. So the bottom line as far as we see it is we are responding to needs expressed by the combatant commanders to fill requirements that they have delineated to us.

We use that process to reprioritize the $60 million we received from you in 1995 and continue in the out years for the program.

In addition to that, we structured an MOU with the Department of Energy and we are taking benefit of a wide range of technologies in the Department of Energy laboratories. What I would like to do at this time, if I could, is spend about 5 minutes just giving you highlights of the program. If I am going too long, sir, please cut me off.

Could I have the first chart, please, Mark.

[Chart deleted.]

I want to give you a feel for the nature of the threat. This is a chart that was shown to the Pentagon leadership just at the onset of the Gulf conflict. The issue here was to try to understand what the magnitude of the chemical, biological, or nuclear threat might be in this regional conflict. It shows the amount of area covered by anthrax, 400 pounds of anthrax released from an aircraft, and it covers roughly 20,000 square miles.

Coincidentally, the way this chart was plotted, it covers both of the seaports where we entered with 95 percent of our sealift capability. It is a very potent weapon and it has the largest area effect of the three.

Chemical weapons are the little green circle shown embedded in the red square, again 400 pounds of chemicals, and a 400 pound nuclear weapon, which is about 20 kilotons, is shown in the left-hand corner. What is not shown there are the EMP effects that would dominate the hemisphere were it detonated at altitude. So I just wanted to calibrate you on the magnitude of that threat.

If you'd put the next chart up for me, Mark, I would appreciate it, and show you how we are intending to deal with this.

[Chart deleted.]

In a sense, this is an overarching concept of operations which reflects the Department of Defense's responsibilities in non and counterproliferation. The first arrow at the top represents our preferred course of action, and that is to stop the proliferation of WMD. So this is proliferation prevention. [Deleted.]

We are also joined in a study with the FBI to understand how we can help them with Department of Defense technologies and training as applied to organized crime operations in Russia with regard to contraband WMD or WMD-related material.

Next chart, Mark.

[Chart deleted.]

The highest priority on the inter-agency study was the detection of biological and chemical agents in the battlefield, both remotely and point detectors. This chart typifies the way we have approached this program. We are building on existing programs. We are not starting a new program.

What we are providing in this area is a long-range LIDAR, which will detect from about 100 kilometers clouds that might be chemical or biological, and then another that at a shorter range, about 5 kilometers, will identify whether those are biological or chemical clouds and, perhaps with success, technological success, we will be able to identify the agents.

This is being done primarily by Los Alamos National Laboratory, with support from Sandia. This was a technology that was fielded in the Gulf war in a C–130 on an emergency basis. It was not used because it was not eye-safe. We are developing nine of these to be put on Blackhawk helicopters that are eye-safe, and that will be moving the program up 6 years, accelerating it 6 years and starting deployment in 1997.

Next chart, please.

[Chart deleted.]

I want to switch now to the area of counterforce. The notion here is to be able to destroy WMD before they are used on our troops, coalition troops, or in particular coalition populations. In these MRCs we are very sensitized to the fact that coalition-building and coalition-maintaining is absolutely crucial to military success, and so we are concerned about the targeting of WMD on civilian populations.

Basically what we will want to do here is to destroy that WMD before it can be used on us.

[Charts deleted.]

We are talking about when these things are used in anger against us, particularly anthrax or other biological weapons, tens of thousands of square miles being contaminated. We are talking about the possibility of contaminating hundreds of square miles when we attack those targets. So our focus in this program is to try to mitigate those effects, to try to be able to predict what they are, to see if we want to attack the target, provide the CINCs with a tool that will allow them to optimize selecting weapons and aim points in his attacking the target to minimize collateral effects.

We are working with the CINC in EUCOM to do this. We have an experiment planned in October at White Sands where we have replicated [deleted] and we will use a surrogate material to see whether or not our calculational tools and planning tools are accurate. We will provide those tools to the user as a result of that operation.

The next chart—let us skip the next one, Mark, and go directly into [deleted].

[Chart deleted.]

[Deleted.]

If you will show the next chart, Mark.

[Chart deleted.]

[Deleted.]

We also are going to provide some equipment for that. [Deleted.]

So what we will be targeting are the adits, we will be targeting the ventilation shafts, the electrical supply. We will listen with these sensors to see if these critical nodes come back up on line, to see if there needs to be a restrike.

Finally, I would like to talk about the terrorist threat. We have not only been charged to bring the chemical and biological response up to the level of the nuclear response, the NEST teams in CONUS or in the United States; we are also very worried about paramilitary threats in theater while we are at war. In other words, we are worried, for instance, about entry into theater and a nuclear or biological weapon being left in a port.

How do we find that weapon, sweep the port, how do we disarm it? Two very similar technical and operational issues between CONUS terrorist threats and OCONUS out of the U.S. paramilitary threats.

We are developing technology that would allow us to deactivate a chemical weapon or a biological weapon and, even if it were to detonate, to contain the effects. We are providing training for the military to bring their capability up to a par with that that is currently enjoyed by the nuclear weapons NEST teams.

With that, I will stop and, if there are no questions, I would turn it over to Captain Gumbert and let him make a brief statement.

Senator SMITH. Let me just interrupt for a second. Senator Thurmond, did you want to ask a question now? Do you have to leave? This is the last witness with a statement. Would you like to listen to his statement before your questions?

Chairman THURMOND. How long is he going to take?

Captain GUMBERT. About a minute, sir.

Chairman THURMOND. Let him go first.

Captain GUMBERT. Thank you, sir. Mr. Chairman, Members of the subcommittee: I am pleased to be here today and to be able to discuss with you the military's participation in the Department of Defense's counterproliferation support program. During the past year the combatant commanders, the services, and the Joint Chiefs of Staff have worked closely with the Office of the Secretary of Defense to identify those areas where military capabilities should be improved in order to address the challenges presented by weapons of mass destruction.

Military members also participated actively in the development of the Department's policy for counterproliferation and in a review of the proposed counterproliferation programs which led to the development of the fiscal year 1995 $60 million program and the fiscal year 1996 $108 million program.

Sir, I would be delighted to entertain any of your questions this afternoon on the military participation in this program.

Senator SMITH. Thank you very much, Captain. Let me say for my colleagues, Senator Thurmond has to leave shortly. Since he only has a few questions, he will lead off. We are in closed session right now. I do not think we have to keep a formal structure here as far as the closed session is concerned. Senator Thurmond, Chairman of the committee.

Chairman THURMOND. Thank you, Mr. Chairman, for your courtesy. I will just take a few minutes to ask a couple of questions.

[Deleted.]

Dr. SHULER. Yes, sir. If I may, I will provide an answer and then ask Dr. Oehler, who is here from the Nonproliferation Center from the Agency, if he would like to add anything.

During the Gulf war we found literally tens to hundreds of tons of chemical munitions stored in Iraq. We still do not understand exactly why they were not used against us, but certainly there was a potential there, enough of a potential to make it a priority for us to prepare for that kind of eventuality.

[Deleted.]

We feel these two examples and others make this a very real threat. We are concerned about biological as well as chemical because of the dual use nature of these threats. Basically, the biological weapons can be made in a pharmaceutical factory. One has to grow the agent or the bugs, if you will, to develop a vaccine to inoculate against it, and many of these diseases are diseases that we normally suffer. Having grown that batch, you have at your disposal the kind of agents you need for a biological weapon.

So this is a very real threat to our forces in future regional conflicts.

Gordon, if you would like to add anything.

Dr. OEHLER. [Deleted.]

Chairman THURMOND. [Deleted.]

Dr. OEHLER. [Deleted.]

Chairman THURMOND. [Deleted.]

Dr. OEHLER. [Deleted.]

Chairman THURMOND. [Deleted.]

Dr. OEHLER. [Deleted.]

Chairman THURMOND. [Deleted.]

Dr. OEHLER. [Deleted.]

Chairman THURMOND. [Deleted.]

Dr. OEHLER. [Deleted.]

Chairman THURMOND. Thank you very much. Now, the only other question I have I will ask Captain Gumbert. Captain Gumbert, what initiatives has the Joint Staff taken to enhance joint force capabilities to implement the Office of Secretary of Defense's counterproliferation policy?

Captain GUMBERT. Sir, the Joint Chiefs of Staff conducted a 6-month study on the most effective ways to implement missions and functions for the various services and CINCs. We have developed a program which we have forwarded to the Secretary of Defense for his approval. It is currently being staffed.

[Deleted.]

Chairman THURMOND. Thank you very much, Captain. Mr. Chairman, thank you for your courtesy. I have another meeting and I will have to leave.

Senator SMITH. Thank you, Chairman Thurmond, for the courtesy of attending.

[Deleted.]

Dr. OEHLER. [Deleted.]

Senator SMITH. [Deleted.]

Dr. OEHLER. [Deleted.]

If I could, Mr. Chairman, the intelligence community, or at least the Director of Intelligence, has recently published a—take several of them up—handbook on BW and CW agents that describes the agents, their effects on humans, how you make them, and so forth, which you may find of interest. It is unclassified.

[Document referred to contained in committee files.]

Senator SMITH. Did the Japanese Government ask us for any help in identifying the type of chemical agent, and is sarin in fact the agent that was used there?

Dr. OEHLER. [Deleted.]

What was your second question?

Senator SMITH. Was sarin the agent used?

Dr. OEHLER. [Deleted.]

Senator LEVIN. [Deleted.]

Dr. OEHLER. [Deleted.]

Senator SMITH. Just one more on this, then I will be happy to yield. The religious cult over there, there were press reports that they may have been cultivating some of these biological agents. Do we have any direct evidence on that?

Dr. OEHLER. [Deleted.]

Senator SMITH. [Deleted.]

Dr. OEHLER. [Deleted.]

Senator SMITH. [Deleted.]

Dr. OEHLER. [Deleted.]

Senator BINGAMAN. Carl, why don't you go ahead?

Senator LEVIN. Could you put one of those charts back on, [deleted] I want to make sure I understand that.

[Chart deleted.]

[Deleted.]

Dr. SHULER. [Deleted.]

Senator LEVIN. [Deleted.]

Dr. SHULER. [Deleted.]

Senator LEVIN. [Deleted.]

Dr. SHULER. [Deleted.]

Senator LEVIN. [Deleted.]

Dr. SHULER. [Deleted.]

Senator LEVIN. [Deleted.]

Dr. SHULER. [Deleted.]

Senator LEVIN. [Deleted.]

Dr. OEHLER. [Deleted.]

Senator LEVIN. Are you trying to stick to these charts?

Senator SMITH. No.

Senator LEVIN. Pass.

Senator BINGAMAN. Just go right ahead.

Senator SMITH. Finish up.

Senator BINGAMAN. [Deleted.]

Dr. OEHLER. [Deleted.]

Senator LEVIN. [Deleted.]

Dr. SHULER. [Deleted.]

So this is a tension between trying to destroy the weapons or deny access to them and also at the same time trying to limit these collateral effects. So precision targeting, targeting the adits, the doors, or in the case of a production facility the power that goes to it, and then watching the facility and coming back for a restrike and doing the same thing over again when they try to get the weapons out, is one way to minimize collateral effects. That is smart targeting.

[Deleted.]

Senator LEVIN. Is Iraq a member of the convention? Have they signed the chemical convention?

Dr. SHULER. Yes, I believe they did.

Mr. HEISER. Yes, they did sign the Biological Weapons Convention.

Senator LEVIN. So that is irrelevant. In other words, we just assume that they are violating the convention that they signed. If they had anthrax there, that is a violation of the convention, is that not correct?

Captain GUMBERT. Sir, there is a chemical weapons convention and a biological weapons convention. The biological weapons convention is in force.

Senator LEVIN. It is in force. So they have signed it. Has anybody else signed the biological weapons convention?

Dr. OEHLER. Yes, there are many countries that have signed up to it.

Senator LEVIN. Have they?

Dr. OEHLER. Yes, they have.

Senator LEVIN. But is it in force?

Dr. OEHLER. That is right.

Senator LEVIN. Because it is ratified?

Dr. OEHLER. I believe that is correct.

Senator SMITH. [Deleted.]

Dr. OEHLER. [Deleted.]

Senator SMITH. Go ahead.

Senator BINGAMAN. Let me ask a couple questions. First on the funding, what about the other $170 million? Is that being spent? This initiative, if it was funded at $400 million, $230 million of it comes from the Department of Defense. Does the other $170 million come from the Department of Energy and the intelligence community?

Dr. SHULER. Yes, sir.

Senator BINGAMAN. Can you tell us if that money is being spent?

Dr. SHULER. We are in the process—we owe you another report May 1 and we are in the process of interfacing with the Department of Energy and the Intelligence Community to understand what contributions they have made.

Gordon, maybe you could answer for the intel community. I will just say for the Department of Energy, the way they do business is a little bit different from the Department of Defense. We have very specific programs directed at specific objectives. The Department of Energy tends to do a research program that has multiple applications.

In our last meeting, which happened at 7 o'clock this morning with Dr. Kaminski with the Department of Energy there, they made the point that they do work for nonproliferation as well as counterproliferation and it is difficult to divide that up.

We are providing them $15 million this year and asking that they identify $15 million of matching funds in long-term R&D. Our money from the Department of Defense will be for them to bring the capability to the prototype stage in areas where the JROC has identified needs. We are asking them to support longer-term R&D where we do not have the capability we can move up at a matching level, and we are currently going through those negotiations.

But other than that, sir, I do not know the status of the Department of Energy response. Maybe Gordon can respond.

Dr. OEHLER. We are gathering that information. As he said, we expect to have that within a month. It would be misleading for me to say anything now because I do not know.

Senator BINGAMAN. Am I right, our calculation on this is that the additional funds that are being asked for in 1996 are about $89 million, not the $230 million, that the only new funds are the $89 million?

Dr. SHULER. For the Department of Defense we are allocating in the fiscal year 1996 budget $108 million, $108.2 million, I believe it is. Yes, $108.2 million.

Senator **Bingaman**. But $18 million of that is from your base program.

Dr. **Shuler**. That is correct, $18 million of that was transferred over from DNA to the counterproliferation account. When you look at the amount we are including in counterforce attacking these hard targets, it looks abnormally high relative to the other areas, because almost all the base has been incorporated in the support program.

For example, in the areas for BW detection, that is supporting a $500 million base program that is not reflected here.

Senator **Bingaman**. There are two aspects of this which probably fall under nonproliferation rather than counterproliferation. That is, what is going on with regard to the threat of proliferation from the turmoil and uncertainty going on in Russia and the former Soviet Union countries? Is that under nonproliferation rather than counterproliferation?

Dr. **Shuler**. Sir, we are doing—the Department of Defense, we are focusing on Department of Defense responsibilities in that area and, as a result of the authorization language, we were asked to work with the FBI, to start those negotiations with the FBI, to see if there are detectors, sensors, training, courses to educate the FBI on what to look for in terms of WMD.

We are in the process of putting together a program with them. We have met twice with them, and that is under my program. As I understand the language, we are permitted to spend up to $1 million in assessing the threat, putting together the program, and if we exceed that level we need to come to you and ask permission to proceed beyond that number, up to a total of $10 million, an additional $9 million.

Senator **Bingaman**. [Deleted.]

Dr. **Shuler**. [Deleted.]

Dr. **Oehler**. [Deleted.]

Senator **Bingaman**. [Deleted.]

Dr. **Oehler**. [Deleted.]

Senator **Bingaman**. [Deleted.]

I just wonder if we are not focused on the egg and not the goose, and the goose is what is going to cause us the problem down the road.

Dr. **Oehler**. [Deleted.]

Senator **Bingaman**. Let me just ask one other question [deleted].

Dr. **Oehler**. [Deleted.]

Senator **Bingaman**. That is also the money we are stealing from Nunn-Lugar, right?

Dr. **Oehler**. I think I am not an expert in this area.

Senator **Bingaman**. Not stealing. That is not the right word. But it is money which——

Dr. **Oehler**. Applying.

Senator **Bingaman**. [Deleted.]

Am I wrong about that?

Mr. **Heiser**. I think, Senator, you are making a good point about our not being as well orchestrated as we should be to try to employ those Russian resources on peaceful and civil kinds of nuclear-related activities, rather than to have them continue to work on nuclear weapons development programs.

I think, as Gordon had mentioned, there is room for us to better organize our effort in that area. Is it worth the investment? Yes, it is worth the investment. [Deleted.]

We do learn. That is part of the way of piecing this together because, you have to keep in mind, they are in transition. They are changing. They are going from job to job. So it is a very difficult task to be able to track these people while the Russian infrastructure itself may be changing.

[Deleted.]

Senator BINGAMAN. Thank you, Mr. Chairman.

Senator SMITH. Senator Bingaman, Monica tells me that in this year's budget there were some $40 million for conversion, for that type of program for Russia. I guess you raised it to $70 million this year. So I think there are some dollars there. Is that right?

Ms. CHAVEZ. In the Department of Energy.

Senator SMITH. In the Department of Energy.

Senator BINGAMAN. So there is $70 million that can be——

Senator SMITH. In this year's budget.

Senator BINGAMAN [continuing]. Expended in Russia to keep these people busy?

Ms. CHAVEZ. That is correct.

Senator LEVIN. Can I pursue that just for a moment?

Senator SMITH. Certainly.

Senator LEVIN. How many are we supporting? How many Russian scientists are getting American dollars today? 1,000, 2,000, 500?

Mr. HEISER. Sir, we are talking now about figures that are associated with the Ministry of Atomic Energy in Russia, and the Energy Department could probably speak to that more effectively than we could in Defense. We would be happy to take that for the record and give you our considered judgment on what those numbers are, but I do not think we can speak authoritatively to the question right now.

[The information follows:]

The Governing Board of the International Science and Technology Center (ISTC) met in Moscow March 30–31. The ISTC supports the redirection to peaceful purposes of scientists and engineers who worked on programs of weapons of mass destruction and missile technology in the Russian Federation and other CIS states. ISTC projects are funded by the United States, the European Union, and Japan. Finland and Sweden joined the ISTC before acceding to the European Union and contribute also to the funding of projects. The Governing Board approved funding for 38 additional ISTC projects representing a funding commitment of $13.6 million. The ISTC projects approved in this meeting bring the total number of projects to 130, representing a total funding commitment of approximately $60 million. (The United States has contributed $35 million for specific projects.) These ISTC projects will sponsor more than 8,200 former weapons scientists and engineers in their transition to nonmilitary endeavors, for periods of up to 3 years.

Senator LEVIN. I just did a little calculation here. Seventy million dollars at $10,000 a scientist, which is an incredible amount of money in Russia, would be 7,000 scientists. The likelihood is that for $2,000 you are doing major support of a person in Russia with hard dollars.

You can multiply it. In other words, $2,000 a year is a lot of money. You can have 35,000 scientists being given significant support. I am curious as to whether we have 700, 7,000, 2,000. It is a very important issue. We have been talking about it for a long time. That figure for the record would be helpful.

Senator SMITH. I ask that the witness provide a response for the record.

Mr. HEISER. Yes, we can provide that.

Senator SMITH. [Deleted.]

Dr. OEHLER. [Deleted.]

Senator SMITH. [Deleted.]

Dr. OEHLER. [Deleted.]

Senator SMITH. [Deleted.]

Dr. OEHLER. I will not put it on that scale, but you do not need——

Senator SMITH. Well, anything. Are there?

Dr. OEHLER. [Deleted.]

Senator SMITH. This brings me to another question that concerns me about this whole issue, and that is who is responsible for making the recommendation to the President. You said you would just pass that one over to the FBI. Is it the FBI, CIA, DOD, or a combination of them?

Let us say we are aware that there is this facility and there is an imminent threat here or we get a report like the Japanese got and did not act on it for 4 or 5 days, and something happened. Who is in charge?

Mr. HEISER. Mr. Chairman, let me just take a couple of minutes and sketch out for you the mechanism that is in place and the plans that we have to deal with these kinds of situations. Quite some time before this event occurred in Tokyo, the interagency community had been looking at the possibility of this sort of incident occurring in the United States.

[Deleted.] When the event took place in Tokyo, an interagency meeting was convened almost instantly to re-examine our current plans and update them as necessary in light of the peculiar aspects of this particular incident in Tokyo.

[Deleted.]

Senator SMITH. But who is your chairman in the interagency group? Is it the FBI?

Mr. HEISER. The interagency group is chaired by the NSC staff.

Senator SMITH. The FBI is going to report to the NSC, the NSC would make a recommendation to the President?

Mr. HEISER. Yes.

Senator LEVIN. It is chaired by a staff? What is that?

Mr. HEISER. [Deleted.]

But other agencies have roles as well. For example, the Department of Defense has an important supporting role to play. [Deleted.]

So there is this interagency deliberation that would take place and a recommendation would be put forward. [Deleted.]

Senator SMITH. Well, I am just looking at it, let us say, is there an option out there for a preemptive strike on either a domestic or a foreign facility that may or may not be linked to one of these first tier countries, but just a facility either in one of those countries or in a third country or in our own country?

Mr. HEISER. Yes.

Senator SMITH. One final point on that. I am interested in how quickly this thing can be resolved. Let us say we get this information. How is this thing filtered up through the NSC to get to the President quickly?

Mr. HEISER. Well, let me see if I can go through this step-by-step. Depending on the nature of the incident or crisis we are talking about, the interagency mechanism I described would have already been reviewing the situation. [Deleted.]

With respect to preemption, preemption is always an option, but we would look to the military authorities, to the Office of the Secretary of Defense and the military authorities, for their recommendations with respect to the application of force outside of CONUS. For the use of force in the United States, the lead agency once again is the FBI. [Deleted.]

This capability has been well established. It has been around for a substantial period of time. It is exercised routinely. There is a very elaborate set of procedures for notification and deployment of these forces. We cannot go into much more detail than that in this forum and at this classification level, but I want you to understand that there are very elaborate plans for the employment of forces. [Deleted.]

Senator SMITH. I do not want to dominate here. I would be happy to yield. I just want to ask one other question in this same area. If we, either troops in the field in some theater of operations or innocent civilians some place in the United States, come under some type of biological or chemical attack, it would be obviously devastating. For example, if a water supply in a large city was contaminated by a biological agent, like anthrax, as you show in the chart there at Baghdad. Do we have medical personnel, both combat and domestic, to handle a situation like that if it happens? I mean, do we have a plan, i.e., the old civil defense plans during the Cold War? Do we have plans to react?

Mr. HEISER. There is a plan. This plan that I alluded to for the United States involves Health and Human Services, for example, FEMA, a whole amalgamation of agencies.

Senator SMITH. It would be FEMA? FEMA would be the one?

Mr. HEISER. FEMA is one agency. If I may, I could give you some of their roles, if you wish to know what the agency roles are.

Senator SMITH. I think it would be sufficient at this point to know that it is FEMA.

Mr. HEISER. FEMA would coordinate the Federal consequence management response. Health and Human Services would be the lead Federal agency for consequence management. The Department of Defense, the Environmental Protection Agency, and the Veterans Administration would be the primary support agencies to Health and Human Services. Defense would be responsible for developing and implementing a plan for early warning of these kinds of incidents that you expressed a concern about.

But once again, for domestic situations, the FBI would have the lead responsibility for criminal response and investigation. Does that give you a sense of the agencies' roles?

Senator SMITH. Yes.

Mr. HEISER. There are plans. You asked if we have an adequate number of medical personnel to respond to an attack on military installations and an adequate number for response to any attack on population. I cannot speak authoritatively to whether we have the appropriate number of medical experts to deal with the kind of incident we have been talking about here. We could arrange to have the experts in FEMA and Health and Human Services provide that information to you if you wish.

Senator SMITH. I guess my concern is that is an awful lot to do for $108 million, if that is all you have. I am not sure you can do it.

Mr. HEISER. We do have procedures, the military has procedures, in the event of attacks on our forces. But I think Captain Gumbert can speak to that.

Captain GUMBERT. Mr. Chairman, if I might, the military certainly has capabilities that are trained and for which we are equipped, and the equipment that is a normal part of the chemical and biological prevention passive defense is not by any means all captured in this counterproliferation $108 million. So there are a lot of funds that are spent by the Army, by the Marine Corps, by the Air Force, to provide for just such situations as a chemical or biological attack.

You also find out that in a real combat situation a chemical attack, although you do injure a significant number of people—there have been many simulations on it and many real life examinations of the battlefield—are not particularly more severe than a significant conventional attack with munitions.

Now, the biological threat is one that we are continuing to do work on because we do not understand it as well, the kind of mechanisms or what effects the ultraviolet rays from the sun have, depending upon when the biological weapon is used. But there is significant work being done on that on a continuous basis and some of that modeling work for simulation is being funded by that $108 million.

Dr. SHULER. If I might add, the chemical and biological defense program is funded at about one half billion dollars. So ours is a small increment of that, but in fact, as I said before, directed mainly at standoff detection and point detection that was identified as a shortfall in that area.

Senator BINGAMAN. I wanted to ask about a different subject, low-cost cruise missiles. My impression is, that over the next 5 to 10 years the proliferation of low-cost cruise missiles is going to be a bigger problem for us than the proliferation of ballistic missiles, and that these are being produced and sold around the world in increasing numbers. Am I right that this is a serious problem? If so, to what extent are we trying to deal with it?

Dr. SHULER. If I might answer that question and then turn it over to Dr. Oehler for expanding on it. This in our counterproliferation support program is one of our greatest concerns. I happened to go over to the Naval Research Lab where I am funding them to do some UAV work. These are unpiloted vehicles like model airplanes to put point biological detectors on, so that they can fly through clouds and give us remote detection.

They provided me this little circuit board. One side of the circuit board is a GPS receiver that will provide 10-meter accuracy; on the other side are the control algorithms for an aircraft. You can buy these components off the shelf.

So what we are confronted with is what I would call, it falls in the category of what we call unconventional delivery. We are not looking for a very low radar cross-section, sophisticated threat. It is a very cheap threat, based on technology that we have developed here in the United States, that has been made available and may potentially be used against us.

[Deleted.]

Gordon this morning told me some other information that I thought you might find interesting regarding some other developments in this area.

Dr. OEHLER. I do not remember what that is. There are some 75 countries that have unmanned aerial vehicles of some type, some 75 countries that have unmanned vehicles of one kind or another, call them cruise missiles. I do not know that the number of countries is going to go up, but the really important point is that with computers, with GPS, these things are going to be very smart, whereas in the past they were not more than model airplanes.

[Deleted.]

Senator BINGAMAN. [Deleted.]

Dr. OEHLER. [Deleted.]

Senator LEVIN. Who is selling them to whom? You said 70 countries. Who is making it?

Dr. OEHLER. Well, a lot of them are made and sold for agricultural reasons. Not a lot of them have been developed for war purposes. But for example, the Israelis are actively selling a couple of very long-range, high altitude unmanned vehicles.

Senator LEVIN. To whom?

Dr. OEHLER. I cannot recall who they have signed up.

Senator LEVIN. Mr. Chairman, could I just ask a couple more questions?

Senator SMITH. Sure, ask them. Then I have a couple more, then we ought to open it up in open session.

Senator LEVIN. There has been a figure thrown around of $108 million and I am a little unclear now as to what that is. The way I read your chart, that is a support program for counterproliferation, that is the portion of the recommended increase which is funded, which means there is a baseline that is funded. So what is the total budget to which that is an add-on to?

Dr. SHULER. Yes, sir. Let me answer that in two parts. Let me preface it by saying we have asked 10 very reasonable men this question, they are smart people, and they have come up with 10 different answers.

Senator LEVIN. You ought to try a woman because you will probably get a better answer. Try one woman. It is a lot better every time. [Laughter.]

Dr. SHULER. Yes, sir.

Senator LEVIN. Give me a range, would you.

Dr. SHULER. The issue here is how much of a U–2 spends its time doing surveillance looking for WMD versus conventional threat, or when you enter a theater how much of that conventional warfighting capability would have been used against the WMD threat were it there.

Senator LEVIN. Can you give us a range?

Dr. SHULER. What I can do is tell you for those things that are uniquely relevant to counterproliferation, and that is if WMD, if the threat of WMD went away, their budgets would be severely impacted, it ranges in the neighborhood of a billion dollars. And this is the chemical-biological defense program.

Senator LEVIN. This is the CB program?

Dr. SHULER. Yes, yes.

Senator LEVIN. Now, this $108 million is an add-on to something in the area of $100 billion?

Dr. SHULER. Something in the area of a billion dollars.

Senator LEVIN. Okay.

Dr. SHULER. That's uniquely related to counterproliferation.

Senator LEVIN. And that's a range, because it's a little confusing the way the chart is, to me at any rate.

Second, would you be able to give us for the record some kind of an apples and apples comparison of how much money is budgeted this year and, say, the previous 2 years for counterproliferation? Could you give it a go so we could have a feel as to whether we are making great progress in budgeting in this area or whether or not we are just rearranging numbers that are already in some other part of the budget?

Dr. SHULER. Yes, sir.

Senator LEVIN. Could you do that for the record?

Dr. SHULER. I will do that for the record, yes, sir.

[The information follows:]

DEFENSE COUNTERPROLIFERATION BASE PROGRAM

The Department of Defense Chemical and Biological Defense Program is the primary base support for the Counterproliferation Support Program. The budget for this program over 5 years follows. The fiscal years 1992–1994 figures are actual obligations, the fiscal year 1995 amount is the actual appropriation, and the fiscal year 1996 amount is the President's budget request. All dollar amounts are millions.

Fiscal year 1992, $445; fiscal year 1993, $383; fiscal year 1994, $386; fiscal year 1995, $356; and fiscal year 1996, $350.

The remaining portion of the base program is located in portions of various Department of Defense Program Elements (PE). There is no single PE (other than the above chemical/biological defense program) which can be labeled as counterproliferation unique. In addition to the above shown $350 million (fiscal year 1996) for this program, I estimate that the other related CP efforts come to roughly $600 million. These amounts appear to show a general decline in funding over the past few years consistent with the overall defense spending decline.

Senator LEVIN. The other question has to do with the nonproliferation treaty. Is the extension of that treaty important to your work?

Dr. SHULER. Absolutely, yes, sir.

Senator LEVIN. Thank you. Thanks, Mr. Chairman.

Senator SMITH. Thank you, Senator Levin. I would assume that you gentlemen would agree that any technology that we can develop to defend against a modern cruise missile or ballistic missile that could possess a chemical or a biological munitions would be a valuable component?

Dr. SHULER. Yes, sir, absolutely.

Senator SMITH. [Deleted.]

Dr. OEHLER. [Deleted.]

Senator SMITH. In what way have they modified them?

Dr. OEHLER. [Deleted.]

Senator SMITH. Captain, I do not know if this is your responsibility. Is our declaratory policy convincing? In other words, will our adversaries be absolutely convinced that if they were to use any of these weapons that we would retaliate? Is that message out there loud and clear in terms of the linkage of deterrence and declaratory policy?

Captain GUMBERT. Mr. Chairman, I think that it may not be absolutely clear, but, I will tell you, it is a very weighty consideration in any of the considerations that they make as to how they might act. And we see that continually when we deal with our friends and allies, discuss with them on a military basis now our posture, and virtually without exception they encourage the very strong stand that we have, the deterrence policy that we take toward any use of weapons of mass destruction.

Senator SMITH. What do you think that understanding is? Is that understanding that it would be focused on the facility that did it, or would it be a broader focus, that there would be a bigger price to pay on the part of the aggressor?

Captain GUMBERT. Sir, I would say that they would look at it as ambiguous. They would not particularly contain it to the facility from which it was used, but they would not necessarily extend it to the whole country. I think there is a certain ambiguity there and the ambiguity they are pleased with, that we are not very clear in the explanation of what that deterrent policy is.

Senator SMITH. Unless someone has something else that ought to be in executive session——

Senator BINGAMAN. Well, I do not know if this should be or not, but I hate to get into open session and have you folks tell me you cannot answer the question.

Senator SMITH. Ask away.

Senator BINGAMAN. Do we have the ability to jam GPS?

Dr. OEHLER. Well, I am not really the proper spokesman, but a GPS jammer is quite feasible over quite a wide range.

Senator BINGAMAN. Do we have a problem of our own military being so dependent on it that we cannot afford to jam it?

Dr. OEHLER. I think our own military can take some prevention measures. When I say “jam” I am speaking more of some civilian applications, such as precision landing on airplanes. If you are going to depend on that to shoot your final approach, you ought to have a backup.

Senator BINGAMAN. [Deleted.]

Dr. OEHLER. [Deleted.]

Senator BINGAMAN. [Deleted.]

Dr. OEHLER. [Deleted.]

Senator BINGAMAN. I see.

Captain GUMBERT. Excuse me, sir. But if I could say, you could also turn off the GPS system. We do have the capability to do that. Now, that in fact tremendously affects the civilian populace that has come to rely very heavily on the GPS system.

Senator BINGAMAN. Yes, you have a lot of people flying around out in my State who are going to wonder where the hell they are.

Captain GUMBERT. Yes, sir, you certainly do.

Senator LEVIN. I have people flying around wondering where the hell they are even with the GPS. [Laughter.]

Senator SMITH. We will adjourn here and reconvene in open session.

[Whereupon, at 3:32 p.m., the closed session was adjourned, the subcommittee to reconvene immediately in open session.]

OPEN SESSION

The subcommittee met in open session, pursuant to notice, at 3:36 p.m. in room SR–232A, Russell Senate Office Building, Senator Bob Smith (chairman of the subcommittee) presiding.

Committee members present: Senators Smith, Levin, and Bingaman.

Committee staff member present: Cindy Pearson, security manager.

Professional staff member present: Lucia M. Chavez.

Minority staff member present: John W. Douglass, professional staff member.

Staff assistant present: Kathleen Paralusz.

Committee members' assistants present: Thomas L. Lankford, assistant to Senator Smith; Richard W. Fieldhouse, assistant to Senator Levin; and Edward McGaffigan, Jr., assistant to Senator Bingaman.

OPENING STATEMENT OF SENATOR BOB SMITH, CHAIRMAN

Senator SMITH. We will now reconvene the committee in open session. We will pick up where we left off. I think there is no need for any new opening statements unless you gentlemen have something else you would like to offer; otherwise, we will continue with the questions.

Senator Bingaman said he had a couple of questions. We would like to wrap this by 4 o'clock if we could, if that is okay with you, Senator Levin.

Senator LEVIN. Fine.

Senator SMITH. Do you want to start, Senator Bingaman?

Senator BINGAMAN. Mr. Heiser, last month Jack Anderson wrote a column which talked about the sale of engine technology to China. You probably saw it. The article caught us somewhat by surprise because we thought we had been assured by the Department of Defense that, while some engines would be sold for a Chinese trainer aircraft program, that manufacturing technology with clear relevance to cruise missile engines would not be sold. That was our impression.

The article cites a Commerce Department official, Ian Baird, as saying that last year the administration lifted controls on this technology. Department of Defense and Arms Control and Disarmament Agency officials have since told our staff that Mr. Baird misspoke and was not speaking for the administration as a whole.

My understanding is that this sale is still under review. Could you clarify where it stands and what the Department's position is on whether this technology is relevant to long-range cruise missiles? Is that something that you are prepared to respond to or do I need to get a response for the record?

STATEMENT OF G. WILLIAM HEISER, DIRECTOR, MILITARY ASSISTANCE AND RESPONSE, OFFICE OF THE UNDER SECRETARY OF DEFENSE FOR POLICY, U.S. DEPARTMENT OF DEFENSE, ACCOMPANIED BY: CAPT. RONALD D. GUMBERT, U.S. NAVY, ASSISTANT DEPUTY DIRECTOR FOR STRATEGY AND POLICY, OFFICE OF THE JOINT CHIEFS OF STAFF

Mr. HEISER. Senator, I can confirm that the sale is still under review, but the officials responsible in the Department for export control matters are not here with us this afternoon. If I could, I would like to take the remainder of your question for the record and come back to you.

[The information follows:]

Allied Signal Corporation has provided some information to the government on its proposal to provide limited production technology on the Garrett engine to China. This proposal is still under review by an interagency group including the Department of Defense. The Department of Defense's principal concern is to ensure that this transfer would not contribute to China's long range cruise missile programs as defined by the Missile Technology Control Regime.

Senator BINGAMAN. I would like to know whether the Department's position that this technology is relevant to long-range cruise missiles, whether that position has changed, because my information was that that is our position.

Let me also ask you about export controls. It strikes me that very little thought is being given to how the proliferation of dual-use technologies, such as these engines that I was referring to, how that proliferation is likely to affect our long-term technological edge. The revolution in military affairs assumes that we alone will be capable of tieing together systems of technologies to achieve dominant battlefield awareness and to precisely target our foes. But if we do not have an adequate nonproliferation strategy, including export controls wherever they can be effective, we are going to make our counterproliferation problems much worse.

Is the Pentagon arguing for export controls, as it traditionally has, whenever they could be effective? And is the Pentagon taking the lead in urging allies to exercise restraint on exports of dual-use technologies, or is this an area we are essentially giving up on?

Mr. HEISER. Senator, once again I am not an authoritative spokesman for the Department on our involvement in the export controls area. However, Mitchel Wallerstein, the Deputy Assistant Secretary of Defense for Counterproliferation Policy, for whom I work directly, is responsible in the Department for those matters, and I can tell you that there are deliberations within the Department of Defense and in the inter-agency community that examine specifically the question you raise: what are the implications for U.S. national security by the sale of these dual-use technologies abroad?

I think I can also assure you that by no means have we thrown in the towel with respect to ensuring that, as far as the Defense Department is concerned, each one of these cases receives thorough scrutiny, not only by the Office of Secretary of Defense but by the Joint Staff, to ensure that there is a full vetting of the national security implications of these sales.

As you point out, it makes very little sense for us to be involved in the export of commodities which in effect undermine our own strategy for dealing with the proliferation of weapons of mass destruction. But I would be happy to go back to the Department, to those responsible officials, and provide a more detailed response to your question for the record.

Senator BINGAMAN. Any additional information you can give us we would appreciate.

[The information follows:]

The Department of Defense continues to be an avid supporter of strong and effective export controls. We work closely with our interagency colleagues at the Departments of State and Commerce to ensure that dual-use technologies are adequately controlled. The principal means for accomplishing this is through our review of export license applications referred by the Department of Commerce and by our continual review of the list of dual-use technologies that require export licenses. We ensure that this review is thorough by involving experts from the military departments, the Joint Staff, and the Department of Defense acquisition and R&D communities. We are also engaged actively with the State Department in multilateral and bilateral efforts to ensure that we have a common framework for effective export controls so that sensitive dual-use technologies are not being transferred to potential adversaries and our industry is not being placed at a competitive disadvantage.

[The prepared statement of Mr. Heiser follows:]

PREPARED STATEMENT BY G. WILLIAM HEISER, DIRECTOR, OFFICE OF MILITARY ASSESSMENT AND RESPONSE, COUNTERPROLIFERATION POLICY

Mr. Chairman, members of the subcommittee, it is a pleasure to join you today to discuss the Counterproliferation Support Program, an acquisition plan which was developed as a part of the Defense Department's Counterproliferation Initiative. This counterproliferation acquisition plan is a good example of the kinds of activities now underway to implement the Defense Counterproliferation Initiative. As you well know, it is the responsibility of the Secretary of Defense to ensure that we take the steps necessary to deal effectively with the military threat posed by the proliferation of Weapons of Mass Destruction (WMD)—collectively nuclear, chemical and biological weapons—and their delivery systems. In this regard, DOD is pursuing this responsibility in five areas: defense policy, acquisition and technology bases, military planning, intelligence capabilities, and international cooperation.

It is no accident that the witnesses before you today represent Counterproliferation Policy, Acquisition, Military Planning and Intelligence Support. The Department's success in addressing the WMD threat depends in large part on the continued close coordination among policy officials, military planners and operators, acquisition executives, and intelligence analysts, all of whom ultimately are supporting our field commanders to ensure they have the requisite capabilities and support to deal effectively with the threat posed by WMD.

I would like to set the stage for the subcommittee's discussion of the blueprint for how the Department is spending the monies appropriated by Congress—the Counterproliferation Support Program—by outlining briefly the Department's counterproliferation policy and how it fits into the administration's National Security Strategy of Engagement and Enlargement.

COUNTERPROLIFERATION—DOD'S RESPONSE TO THE PROLIFERATION THREAT

The Defense Counterproliferation Initiative was designed to achieve two fundamental goals:

— First, to strengthen DOD's contribution to government-wide efforts to prevent the acquisition of these weapons or to reverse it diplomatically where it has occurred; and second

— To protect U.S. citizens, forces, allies and friends from the effects of weapons of mass destruction in the hands of hostile forces by ensuring that U.S. forces have the equipment, doctrine, training, and intelligence information needed to defeat an opponent with WMD.

DOD COUNTERPROLIFERATION POLICY

The proliferation of WMD and the systems to deliver them is one of the most serious security threats that the United States, its allies and friends confront in the post-Cold War era. The U.S. Government is intensifying its efforts to prevent proliferation of WMD. We must also recognize, however, that these efforts will not be successful everywhere and at all times, and that these weapons will remain both a present and future military threat to U.S. forces, allies, and friends. As Desert Storm illustrated, there are many potential situations where U.S. military forces may become involved and may have to face opponents with weapons of this type.

The Department of Defense therefore is giving renewed attention to countering the proliferation of WMD in its defense programming and planning in the areas of regional security strategies, deterrent strategies, intelligence strategies, and offensive and defensive capabilities and responses. In addition to giving new emphasis to the proliferation of WMD as a military threat, the Department of Defense is also strengthening its contributions to the national nonproliferation effort by applying its technical, military and intelligence expertise to arms control, export controls, and inspection and monitoring. Together the strengthened efforts to prevent proliferation and to protect U.S. forces, allies, and friends in the face of proliferation, where it does occur, form the basis of this comprehensive approach, which we term *counterproliferation.*

DOD *counterproliferation policy* applies, inter alia, to the development of requisite U.S. military capabilities and requires U.S. forces to be prepared to execute offensive and defensive military operations to counter the deployment and employment of WMD. Moreover, by ensuring that U.S. forces are trained, equipped and prepared to deal with WMD, we also signal would-be proliferant states that the tactical battlefield advantages they expect to achieve from the threat or use of WMD will be extremely limited, and clearly not worth the enormous cost and risks involved.

The United States, of course, does not face the threat of WMD alone. The legitimate security interests of our allies and friends are directly affected, with the severity of this threat varying from region to region. Consequently, the U.S. plans to work closely with concerned countries to address the proliferation threat.

COUNTERPROLIFERATION POLICY OBJECTIVES

The major objectives of the DOD *counterproliferation policy* are as follows:

— prevent the acquisition of WMD and missile capabilities.
— Roll back proliferation where it has occurred.
— Deter the use of WMD and their delivery systems.
— Adapt U.S. military forces and planning to operate against the threats posed by WMD and their delivery systems.

To achieve these *counterproliferation policy* objectives, U.S. forces should possess a spectrum of capabilities. U.S. forces should be prepared to support U.S. Government commitments in efforts to monitor, inspect, destroy or convert to peaceful uses WMD and associated capabilities of a proliferant. Counterproliferation military operations conducted by U.S. forces will demand real-time global reconnaissance; surveillance; tracking; command, control, communications and computers; intelligence support; active and passive defenses; and, counterforce capabilities.

The military dimension of counterproliferation policy consists of three main elements:

Deterrence. The Department of Defense will maintain a full range of military capabilities, consistent with our international obligations, to provide a credible deterrent to the threat or use of WMD and their associated delivery systems against the United States, our Armed Forces, allies and friends. U.S. forces will be prepared to employ these capabilities as directed to ensure that the costs to the proliferant of the use or threatened use of WMD are unacceptable.

Destruction. U.S. forces should be capable of conducting a full range of military operations to deal effectively with the WMD threat to include wartime operations against an adversary equipped with WMD and associated delivery capabilities.

Defense. Active and passive defense measures also contribute to counterproliferation. Proliferant states whose neighbors have effective defenses will find their expensive offensive weapons rendered less than effective for purposes of intimidation and even direct attack. Further, non-proliferant states that can confront a proliferant neighbor with defensive systems of demonstrated effectiveness and proven reliability have little need to seek their own weapons of mass destruction. Missile defense cooperation, including early warning sharing and cooperative deployment of missile defense systems capable of defeating theater ballistic and cruise missiles, is an essential component of DOD counterproliferation policy. Development and deployment of missile defense systems, which can intercept a missile with a high degree of confidence, and prevent or limit contamination should the incoming missile be carrying a nuclear, biological or chemical munition, are essential for U.S. or coalition forces in regions where a WMD threat exists. Passive defenses to provide battlefield detection of, individual and collective protection against, and decontamination of chemical and biological warfare agents are also requisite capabilities to deal effectively with the threat of WMD, and are particularly important in negating the perceived usefulness of WMD during armed conflict or as instruments of political terror.

COUNTERPROLIFERATION AND U.S. NATIONAL SECURITY STRATEGY

The administration's National Security Strategy of Engagement and Enlargement has three central components:

— our efforts to enhance U.S. security by maintaining a strong defense capability and promoting cooperative security measures;

— our work to open foreign markets and spur global economic growth; and,

— our promotion of democracy abroad.

A key part of our strategy is to develop an effective capability to respond to the major dangers to U.S. security that we confront—those posed by WMD and their delivery means, regional aggression, and threats to the stability of states. Counterproliferation is the Defense Department's response to the military threat posed by WMD proliferation, and constitutes an integral part of our overall National Security Strategy.

Through complementary programs such as Nunn-Lugar Cooperative Threat Reduction efforts and other denuclearization initiatives, we are pursuing cooperative security measures to build a more secure international environment. As you know, DOD is engaged with its Russian and other former Soviet Union state counterparts in efforts to smooth the return of all nuclear weapons to Russia and accelerate dismantlement of excess nuclear weapons. In addition, DOD is working with other U.S. agencies to provide improved security and accountability for nuclear weapons in the FSU. These efforts well serve both U.S. counterproliferation and nuclear force reduction goals.

Taken together, the Counterproliferation Initiative and the Cooperative Threat Reduction efforts highlight the range of activities in which DOD is involved to stem the proliferation of WMD and to develop an effective capability to deal with the WMD threat.

Mr. Chairman, I hope this brief presentation provides a helpful overview for the subcommittee on the Defense Department's Counterproliferation Initiative and how it fits into our National Security Strategy, and sets the stage for a good discussion of DOD's Counterproliferation Support Program. I would be happy to address any questions you may wish to raise concerning our Counterproliferation Policy.

Senator BINGAMAN. Thank you very much, Mr. Chairman.

Senator LEVIN. I just have one question, Mr. Chairman.

Senator SMITH. Senator Levin.

Senator LEVIN. Dr. Shuler, your public testimony here has a figure of $108 million for that part of the recommended increase in counterproliferation support that was actually in your budget request; is that correct?

STATEMENT OF DR. WILLIAM B. SHULER, DEPUTY ASSISTANT TO THE SECRETARY OF DEFENSE FOR COUNTERPROLIFERATION, OFFICE OF THE ASSISTANT TO THE SECRETARY OF DEFENSE FOR ATOMIC ENERGY, ACCOMPANIED BY: DR. GORDON OEHLER, THE NONPROLIFERATION CENTER

Dr. SHULER. Yes, sir, for 1996.

Senator LEVIN. Can you provide us for the record an estimate of what the baseline counterproliferation program is?

Dr. SHULER. Yes, sir, I can. For those parts of the program that are unique to counter-weapons of mass destruction, i.e., those parts that would be significantly impacted if the threat of weapons of mass destruction were to vanish, that number is roughly a billion dollars, mostly comprised of our chemical and biological defense program.

Senator LEVIN. Would you then supply for the record how that baseline number has changed over the last, say, 5 years or 3 years to show us that change over time?

Dr. SHULER. Yes, sir, I will do that for the record.

[The information follows:]

DEFENSE COUNTERPROLIFERATION BASE PROGRAM

The Department of Defense chemical and biological defense program is the primary base support for the counterproliferation support program. The budget for this program over 5 years follows. The fiscal years 1992–1994 figures are actual obligations, the fiscal year 1995 amount is the actual appropriation, and the fiscal year 1996 amount is the President's budget request. All dollar amounts are millions.

Fiscal years 1992, $445; 1993, $383; 1994, $386; 1995, $356; and 1996 $350.

The remaining portion of the base program is located in portions of various Department of Defense program elements (PE). There is no single PE (other than the above chemical/biological defense program) which can be labeled as counterproliferation unique. In addition to the above shown $350 million (fiscal year 1996) for this program, I estimate that the other related counterproliferation efforts come to roughly $600 million. These amounts appear to show a general decline in funding over the past few years consistent with the overall defense spending decline.

[The prepared statement of Dr. Shuler follows:]

PREPARED STATEMENT BY DR. WILLIAM B. SHULER, DEPUTY ASSISTANT TO THE SECRETARY OF DEFENSE

Mr. Chairman and members of the committee, I am pleased to have the opportunity to discuss the Department of Defense's Counterproliferation Initiative, in general, and the specific activities of the Counterproliferation Support Program, in particular, with you today.

The Counterproliferation Support Program was established to address DOD's responsibilities in responding to the nonproliferation and counterproliferation "Areas for Progress" identified in the May 1994 Non/Counterproliferation Program Review Committee's (NPRC) Report to Congress. The Areas for Progress addressed by the Counterproliferation Support Program correspond to key shortfalls in U.S. capabilities to both counter the proliferation of Weapons of Mass Destruction (WMD) as well as respond to the threat of their use on the tactical battlefield. In this context, WMD include nuclear, biological and chemical weapons and their delivery systems. The Areas for Progress were selected and prioritized by the NPRC to address interagency shortfalls in our national non- and counter-proliferation programs. Those that are the responsibility of DOD were reviewed and prioritized by the Joint Requirements Oversight Council (JROC) of the Joint Chiefs of Staff. The goal of the Counterproliferation Support Program is to improve military capabilities to limit, deter, and respond to WMD threats by building upon ongoing programs in the services, DOD agencies, and the Department of Energy that address major gaps in deployed capabilities, leverage existing capabilities by accelerating ongoing programs, and enhance the development of high payoff technologies.

It must be noted that the Counterproliferation Support Program occurs in the context of the much broader DOD-wide Counterproliferation Initiative. This Initiative includes large ongoing acquisition and RDT&E counterproliferation-related programs, such as: ballistic and cruise missile defense; efforts to counter WMD paramilitary and covert delivery threats; nuclear, biological and chemical defense; mobile target surveillance and kill; chemical and biological warfare vaccine R&D, production and medical response; various advanced weapon and sensor systems to counter WMDs; counterproliferation-focused intelligence collection; C^4I enhancements; and general improvements in battlefield situational awareness.

The Counterproliferation Support Program evolved from DOD's $230 million portion of the $400 million program recommended by Deputy Secretary Deutch and the NPRC. The DOD portion is supported by the $60 million authorized and appropriated by Congress in fiscal year 1995. The President's budget for fiscal year 1996 is $108.2 million. Reprogramming within ongoing projects and internal DOD program optimization led to the lower funding level. In addition, the current funding level was considered to be the most realistic based on DOD budget realities.

The following table illustrates how the Counterproliferation Support Program compares to the Counterproliferation Areas for Progress described in the 1994 NPRC report.

[Dollars in millions]

NP/CP Areas for Progress (DOD-Related)	NPRC Report Recomm Increases	DOD Portion of Increases	CP Support Program Fiscal Year 1996 Funding
Real time detection/characterization of BW/CW agents including stand-off capability	$75.0	$38.0	$23.6
Underground structures detection/characterization	75.0	37.0	13.1
Hard underground target defeat including advanced non-nuclear weapons capable of holding counterforce targets at risk with low collateral effects	40.0	40.0	[1] 49.3
Detection and tracking of shipments and control and accountability for stocks of WMD-related materials	25.0	0.0	[2] 2.9
Capability to detect, locate, and render harmless WMD in the United States	10.0	10.0	5.1
Capability to detect, locate, and disarm, with a high assurance and in a timely fashion, outside the United States WMD hidden by a hostile state or terrorist in a confined area	15.0	15.0	(included in above)
Enhanced collection and analysis of intelligence (MASINT support)	25.0	10.0	1.9
Passive defense capabilities enabling military operations to continue in contaminated conditions—actual or threatened (low cost, lightweight)	15.0	15.0	11.7
Detect and intercept low flying/stealthy cruise missiles	50.0	50.0	0.0
Rapid production of protective BW vaccines	15.0	15.0	0.0
Non-DOD related areas	55.0	0.0	0.0
Totals	$400.0	$230.0	$107.6

[1] This amount includes the transfer of the $18.6 million from the base DOD program, therefore the Counterproliferation Support Program increment is only $30.7 million.

[2] The NPRC Report failed to identify the DOD intelligence contribution to this task. The Counterproliferation Support Program contribution funds shortfalls in Navy Intell.

The DOD and the Counterproliferation Support Program are currently responding to 10 of the 14 areas where an additional commitment of resources was recommended. The other four areas, with total recommended funding of $55 million, are primarily the responsibility of the Intelligence Community, the Department of Energy, the Department of State, the Department of Commerce, and the Arms Control and Disarmament Agency. Approximately 60 percent ($230 million) of the $400 million in recommended spending increases are the responsibility of the DOD. The Counterproliferation Support Program's total fiscal year 1996 budget is slightly less than half of the level recommended in the NPRC Report.

This limited budget is focused on high impact, high payoff areas. By leveraging existing programs with supplemental funding to accelerate project schedules and deliverables, we believe that, by the end of the decade, the Counterproliferation Support Program will have achieved significant advancements in operational counterproliferation capabilities in most of the identified Areas for Progress. To achieve these advanced capabilities, emphasis has been on accelerating the deployment of enhanced military capabilities and accelerating RDT&E of technologies that will lead to rapid fielding of operational systems.

Before I discuss specific projects that comprise the Counterproliferation Support Program, I would like to put them in the context of a reality which I believe will dominate future conflicts involving the use, or the threatened use of, WMD by an adversary. First I will point out the obvious: if it is necessary for our forces to engage an adversary in a future Major Regional Conflict (MRC), we would much prefer to do so without facing WMD on the battlefield. Therefore, nonproliferation, or halting and rolling back the spread of WMD and associated delivery systems is a high DOD priority.

Realizing, however, that our efforts to halt proliferation of WMD have not been entirely successful, DOD has a special responsibility to prepare our troops to fight, survive and win any conflict involving the use of WMD by an adversary where response-in-kind may not be an option. At the current time over 20 countries, many of them hostile to the United States or our allies, have WMD or are suspected of developing WMD for use in the battlefield.

Future MRCs are likely to be dominated by coalitions and coalition operations as was the case in the Gulf war. Building and maintaining coalitions in such conflicts will be key to successful military operations. WMD, deployed by an adversary, have the potential of inflicting massive casualties on troops and coalition civilians. For example, a single optimally delivered biological weapon can inflict casualties over tens of thousands of square miles, holding coalition states hostage to the demands of a WMD adversary. Our ability to protect against WMD, therefore, becomes a paramount consideration in building and maintaining coalitions as well as succeeding in military operations.

Our overarching concept of operations to achieve this goal is composed of five parts: proliferation prevention; counterforce capability to eliminate our adversary's WMD before he can use them on us; active defense against theater ballistic missiles and cruise missiles; passive defense to protect our troops against the effects of a WMD attack; and countering paramilitary and terrorist activities. These comprise the main areas of focus for the Counterproliferation Support Program. A continuing DOD priority, endemic to all counter-WMD operations on the battlefield, is a robust command, control, communications and intelligence infrastructure.

Now let me summarize briefly some of the specific projects that constitute the Counterproliferation Support Program and that address the concerns embodied in the counterproliferation Areas for Progress. DOD and the Counterproliferation Support Program have developed a multi-tiered response to counter WMD threats that seeks to devalue their perceived utility and, consequently, to make their acquisition unattractive to a would-be proliferant state. This underpinning of deterrence is achieved by aggressively pursuing capability improvements in the five key counterproliferation functional areas: (1) proliferation prevention—to deny attempts to acquire WMD capabilities; (2) counterforce—to detect, characterize, and destroy hostile WMD forces and their supporting infrastructure elements, should this become necessary; (3) counter-paramilitary/terrorist activities—to protect U.S. military facilities and logistical/mobilization nodes against the possible use of chemical/biological agents by irregular military forces or terrorist organizations; (4) active defense—to protect U.S. and allied forces and noncombatants by intercepting and destroying WMDs launched by a hostile adversary; (5) passive defense—to protect U.S. and allied forces and noncombatants against nuclear, biological and chemical effects associated with WMD use.

DOD's role in *proliferation prevention* involves several organizations working in diverse areas such as verification and enforcement support for nonproliferation treaties executed by the On Site Inspection Agency, WMD control regimes, and intelligence collection and analysis. The Counterproliferation Support Program is directly supporting the deployment this year of a Navy system to identify and track suspected shipments of WMDs and WMD-related materials. The Counterproliferation Support Program is also supporting a joint DOD/FBI effort to assess the threat of organized crime activities within the former Soviet Union involving WMD smuggling and to determine whether DOD technologies, operational capabilities and training programs can benefit the FBI.

In the *counterforce* area, DOD is devoting substantial resources to improve our capabilities to defeat WMD threats before they can be used against U.S. and allied forces and noncombatants. Service resources are, of course, being devoted to maintaining U.S. forces at the highest state of readiness to enable a quick and effective response in regional contingencies throughout the world, even in contingencies, like Desert Shield/Desert Storm, where WMD may be a real and credible threat. Resources are being targeted specifically on improving counterforce capabilities to find and destroy WMD forces and their supporting infrastructure elements including production and storage facilities as well deployed WMD forces. These assets include surface, hardened underground and tunneled facilities as well as mobile missile launchers and Command, Control and Communication installations. The Counterproliferation Support Program is supporting projects in this area, including: (1) developing enhanced sensor technologies for target surveillance, characterization, battle damage assessment, rapidly convergent retargeting, and collateral effects monitoring; (2) improving the understanding of collateral effects release phenomenology and transport; (3) improving the state of knowledge in weapons effects and target response; (4) developing advanced warheads for enhanced lethality and functional kill against hard underground targets; (5) developing advanced all-weather penetrating weapons for hard underground target defeat; and (6) integrated operational testing to support the rapid fielding of these new capabilities.

In the *counter-paramilitary/terrorist activities* area, the Counterproliferation Support Program is sponsoring projects designed to counter threats against military facilities and logistical/mobilization nodes. These efforts include developing advanced enabling technologies and equipment to support Special Operations Forces and funding joint training exercises to improve the readiness of nuclear, biological and chemical response teams. Such measures help ensure that roles and responsibilities are well defined and that the technology meets the requirement of the mission. The recent chemical weapons incident in the Tokyo subway demonstrates vividly the need for these types of technologies and contingency response teams. Projects such as the Chemical Weapon Surface Acoustic Wave Detector, chemical agent Perimeter

Monitor, and the disposable "Quick Mask" chemical agent contingency protective mask have been identified for funding and development by the Counterproliferation Support Program in anticipation of countering just such types of evolving threats. These and other related forward looking projects will continue to be a high priority for the Counterproliferation Support Program over the next several years.

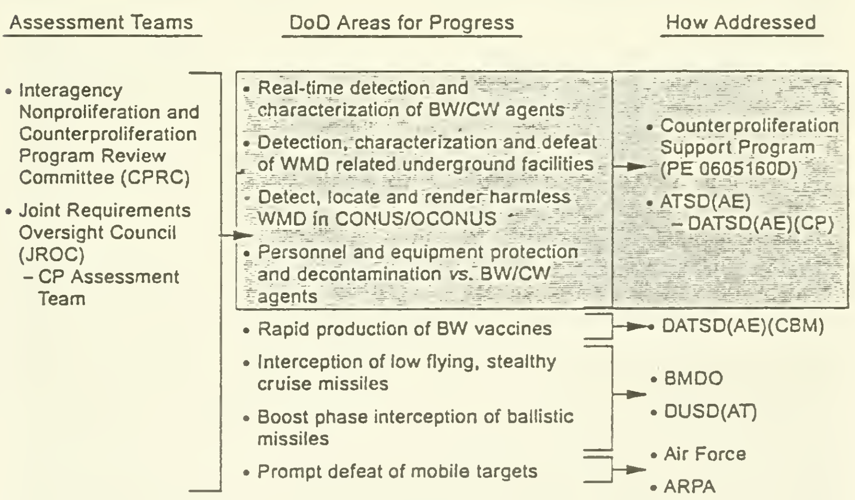
Active defense against theater ballistic missiles, cruise missiles and aircraft, particularly those armed with WMDs, continues to be a top DOD priority. The Counterproliferation Support Program is not directly funding these projects because ongoing programs in these areas were deemed to be adequately funded in the President's budget by the NPRC. However, Congress reduced the fiscal year 1995 boost phase intercept budget by approximately $60 million. The current funding level of $40 million is not adequate to address the boost phase intercept problem.

In the *passive defense* area, DOD supports an extensive nuclear, biological and chemical defense infrastructure to protect U.S. forces on the WMD battlefield. The Counterproliferation Support Program is accelerating the deployment of equipment and technologies designed to enhance current operational capabilities by: (1) accelerated fielding of biological and chemical weapons agent sensors, including accelerated fielding of an advanced lidar system by 6 years to improve long range battlefield warning of WMD effects; (2) accelerated deployment by 2 years of individual and collective protection gear, including a new and improved joint service lightweight protective suit for combat wear; (3) supplemental funding for the chemical and biological weapons decontamination technology base; and (4) enhancements in joint nuclear, biological and chemical battlefield simulation, training, operational planning and doctrine development.

In closing, let me reemphasize that we are committed to improving our military capabilities in countering WMD threats by bringing to fruition the vision embodied in the Counterproliferation Areas for Progress. In so doing we will improve our military counterproliferation capabilities in the five key areas of: proliferation prevention, WMD counterforce, counter-paramilitary/terrorist activities, active defense, and passive defense. We are confident that these cost-effective efforts will lay a firm foundation for credibly deterring the acquisition and use of WMDs by those who may seek to do so.

Thank you, Mr. Chairman, for the opportunity to address your committee.

Counterproliferation Areas for Progress



Assessment Teams	DoD Areas for Progress	How Addressed
• Interagency Nonproliferation and Counterproliferation Program Review Committee (CPRC) • Joint Requirements Oversight Council (JROC) – CP Assessment Team	• Real-time detection and characterization of BW/CW agents • Detection, characterization and defeat of WMD related underground facilities • Detect, locate and render harmless WMD in CONUS/OCONUS • Personnel and equipment protection and decontamination *vs.* BW/CW agents	• Counterproliferation Support Program (PE 0605160D) • ATSD(AE) – DATSD(AE)(CP)
	• Rapid production of BW vaccines	DATSD(AE)(CBM)
	• Interception of low flying, stealthy cruise missiles • Boost phase interception of ballistic missiles	• BMDO • DUSD(AT)
	• Prompt defeat of mobile targets	• Air Force • ARPA

Senator LEVIN. Thank you. Thank you, Mr. Chairman.

Senator SMITH. Gentlemen, are U.S. forces capable of both detecting and protecting themselves against the use of weapons of mass destruction on the battlefield?

Dr. SHULER. If I may take that question, Mr. Chairman, and then I will refer to Captain Gumbert. For the most part, I think we have an extremely good capability to respond to weapons of mass destruction, particularly in the chemical area. The biological area happens to be much simpler in terms of response. A simple mask for the most part provides protection against biological agents. However, we have focused as a high priority on improving our capability to detect biological weapons, particularly remotely at a distance, to provide us earlier warning. Captain Gumbert, would you like to add to that?

Captain GUMBERT. Yes, sir. I would say that responding to a chemical and biological environment is a very demanding task in the military operation, generally requiring at least a mask and normally a suit of some sort, which does decrease your mobility and your ability to conduct operations in a certain area.

You also then have the tasks of decontaminating equipment and personnel that could be subjected to any of these agents. So it remains a formidable task and one in which we are working continuously to improve our capability, to improve the kinds of devices we have for protection of personnel, and to improve the capability to operate in environments.

As an example, if you are operating in some kind of suit in the desert, overheating becomes a significant problem. So there are significant amounts of resources being devoted to looking ahead and determining how we can better address these issues, and these are some of the specific issues that we have addressed here in this counterproliferation support program.

Senator SMITH. Answer this as specifically as you can here, in an unclassified setting. In 1972 the United States, under President Nixon, agreed to destroy our biological weapons or began the process of destroying them. What is our policy if biological weapons are used against us?

Mr. HEISER. Mr. Chairman, as you know, we have foregone the use of biological weapons for our own purposes. We do not have an offensive biological program. In our pronouncements to date, we have made it clear that any potential adversary that would employ nuclear, chemical, or biological weapons against U.S. forces or its allies would face a formidable response from the United States. And we have seen, I think, ample evidence of that in the way we have handled the Operation Desert Storm situation.

We would bring to bear overwhelming force so that there would be no question in the minds of these potential adversaries that the risks associated with their employment of these kinds of weapons would far outweigh any potential benefits. I think they have a clear understanding of that based on our policy pronouncements to date.

Senator SMITH. Are the U.S. nonproliferation policies right now and the recent decontrol of some critical technologies for export—connect that with the proliferation programs in the countries with which we are concerned, if you can? Are we seeing greater proliferation as a result of exporting technology, or less proliferation and, if so, where and why, wherever you can indicate where that is in public session?

Dr. OEHLER. Most countries that are developing weapons of mass destruction programs do it because of problems with their neighbors, I think that as you look around, as the world situation has changed, with Russia in particular and the superpower umbrella there, what you see are more countries concerned about what their neighbors are doing and feeling that they have some legitimate need for development of some weapon like that.

Senator SMITH. Would you like to see more or less control of some of the dual-use technology?

Dr. OEHLER. The dual-use technologies which are applicable to weapons of mass destruction, we would like to see more control of. I think in the last few years you have seen the international organizations, such as the Australia Group, the Zanger Group for nuclear, and the Missile Technology Control Regime, take on increasing effectiveness.

All of these organizations have some form of control list which is agreed to by all parties and which actually has had a very significant impact on raising the costs, at a minimum, and actually denying some countries given capabilities.

Senator SMITH. Captain, what joint or cooperative efforts do we have now with our allies to prevent this type of proliferation of weapons of mass destruction, other than the formal structures of treaties and the United Nations and so forth? But beyond that, what specific alliances do we have with our allies or agreements, that you can talk about?

Captain GUMBERT. Sir, certainly the NATO alliance has specifically addressed chemical and biological threats in the past, and as part of the joint training that is conducted between the countries, as part of that alliance, that effort is ongoing.

We also have a relationship with Japan where we have worked with them in the preparation for and preventive use and taking actions to prevent contamination of the battlefield and how you would respond in those areas. Other than that, there is obviously an exchange of doctrine and of procedures we have with our friends and allies and coalition partners, so that if there is a threat in a particular environment we would certainly discuss that with them and provide training for them at some of our schools. Many of those countries have sent students to our Army training centers where that kind of training is being done.

Senator SMITH. Would you consider a biological or a chemical attack on a large city, say a European city that was a member of NATO, within the constraints of that alliance similar to a military attack, if you will, by weapons other than weapons of mass destruction?

Captain GUMBERT. Sir, I am not an expert on NATO.

Senator SMITH. Well, NATO or not. Leave NATO out of it. Is there a similarity between, let us say, a rocket attack on a European city and a biological attack? Let us use the example of Japan since that is in the news. If that were to be linked to another nation—I do not want to mention a nation's name, but let us say it was linked to—I am not saying that it is linked, but I am just saying in a generic theoretical sense here if it were linked to another nation—how would the United States read that? Would that be the same as a military attack in terms of our alliance agreements?

Captain GUMBERT. Certainly a rocket attack of any sort would be an attack.

Senator SMITH. Well, of course. I am asking if a biological attack would be treated the same as a rocket attack?

Captain GUMBERT. Sir, the military response would be to treat it in the same vein and then it would become a political decision on how we would respond as a nation and as an alliance to that particular attack.

Senator SMITH. This would be the equivalent of a military attack if it were linked to another nation?

Captain GUMBERT. Yes, sir, that is how I would view that.

Senator SMITH. Do you all agree with that?

Senator Bingaman, do you have any questions?

Senator BINGAMAN. Let me just ask a general question. In these control regimes that we have in place, Missile Technology Control, all the other different groups, the Nuclear Suppliers Group, as technologies proliferate I assume that the logical thing is to shorten the list of things you're trying to control, because you have to conclude, reluctantly, but you have to face the facts that you no longer are the exclusive countries that have this technology, such as computers, and that it has become much more available.

Is that what is happening? Do we have a situation where the lists of things that we can control or try to control through these organizations is getting shorter and shorter because the proliferation of technology is continuing in spite of our best efforts? Is that what is going on?

Dr. OEHLER. I think for most of the international control regimes you have not seen yet the list get shorter. I think in the United States one area that has made the biggest difference has been computers, where computers have been essentially decontrolled because they are not controllable, and also the judgment is that the really high-performance computers are not needed by a developing country to develop first generation nuclear, chemical, or biological weapons.

But again, going back to the international control regimes, there has not been a reduction in the number of chemicals on the Australia Group list or the materials that are on the MTCR annexes.

Senator BINGAMAN. Should there be? I have always thought that the conventional wisdom in this area was you control only those things you really can effectively control, you build high walls around fewer things, that kind of theory.

Dr. OEHLER. I think that they focus more on the countries. They try to get the countries to sign up to being responsible members of the community and then take them off the list and allow them to purchase these materials. For example, an awful lot of nuclear materials and technologies are available to countries that sign up to the NPT and the IAEA safeguard provisions.

So that is the approach, rather than trying to back, so far as I see, off on the level of technologies on the list. You have to remember that there are still many countries that are interested in developing programs using very old approaches. The North Korean nuclear program is an example. So even though you might think some of these things are available, actually having it on an embargo list raises the cost to them in continuing those programs.

Mr. HEISER. But Senator, I would like to add a footnote on that. I think you put your finger on a very troubling trend. The fact of the matter is in international commerce there is increasing availability of more and more sophisticated technologies and equipment. Technology is not standing still in developing countries.

So there is an overall trend where the kinds of sophisticated technologies that in the past we thought there would be little chance of falling into the hands of potential problem countries are more readily available now as a result of this international dynamic of the trends in technology development.

The lists do not necessarily shrink, but the availability and the expertise and talent in developing countries are expanding, and therefore the knowledge and technologies available to potential adversary countries are similarly expanding. So it is going to be a problem that poses even greater demands in the future. The problem is not going to become easier. It is going to become more difficult over time, I am afraid.

Senator BINGAMAN. Particularly, I guess it is difficult because the more I hear from people in charge of the Department of Defense, this dominant battlefield awareness is our advantage and that is where we think we have the capability to prevail in future warfighting situations. We have that and others will not have that, and that depends heavily on technology.

You are saying, as I think is correct, that the technology is less and less subject to being controlled and kept from our adversaries, potential adversaries.

Mr. HEISER. Well, I am saying it is more difficult to control, in part because of the international trend that is under way with the development of countries. Technology does not stop. They are training more scientists. The educational level raises, and just as a part of commerce and this trend generally, it is going to be more and more of a problem.

The fact of the matter is more and more sensitive technologies, as a result of the trends in international commerce, are going to be available to countries that we would prefer did not have them. It is a tough problem. The solution is not, as you suggest, as you mentioned earlier in our discussion—you cannot throw in the towel on this. You cannot give up. You have to find ways to work on these issues in international regimes to try to stem the problem. But it is a very tough issue.

Senator BINGAMAN. That is all I had, Mr. Chairman.

Senator SMITH. If I could, I would like to follow-up with Mr. Heiser's point for a minute. The problem is that we are exporting our own technology and then literally racing to catch up with our own technology, at a tremendous cost in times when budgets are pretty tough, as you understand. And obviously, it was not the technology being spread around, critical technologies, and other countries were not picking it up, in particular, those countries that we do not want to have it, we could continue to rely on our advanced technology and stay ahead a lot longer and save ourselves a lot of dollars.

I do not want to be critical about it, but it seems like in many ways the administration has thrown in the towel on export controls. In some of this critical technology, it has been opened up and it is being exported. I would like to see a list, if you could submit it for the record, of any technology that you feel is being proliferated, if you will—not a very good term, I guess, used in that sense, but I guess it is the right term—that you feel that is being done now, that you think is critical and ought not to be out there for other countries to have access to.

Mr. HEISER. You mean, Mr. Chairman, based on our exports of that particular technology?

Senator SMITH. Yes, our own, or western exports, but certainly ours. We can control ours. I mean, we cannot control somebody else's necessarily. But any exports, but certainly ours, because I think in terms of the decisions one of the main reasons for this hearing is to try and determine that, just where we should be, where we should be restricting, realizing a lot of this technology is dual-use and certainly the type of technology that, because it has that dual use, some domestic, some military, it is very difficult to do that.

[The information follows:]

As I mentioned earlier, we continually work with our interagency colleagues and with experts in other parts of the Department of Defense to refine the lists of technologies and items that need to be controlled to protect our national security interests. This is an ongoing process of updating the lists and takes into account both new and existing technologies that may have military applications affecting U.S. security interests.

Senator SMITH. You folks are in positions to know just what would be critical and what would not be, and I think it is important to know that.

Mr. HEISER. We agree with you, Mr. Chairman. We think this is a very important issue that we ought to come back to repeatedly. In fact, we need to continue the dialogue, I think, with the staffs on this matter so that we have a proper bearing on all these issues.

You are absolutely right, if we are not careful we are going to undermine our own strategy, our own capabilities.

Senator SMITH. A certain amount can be helpful. Everybody knows that. Let me just frame the final question in this form: what has been the effect of terminating COCOM on your programs? I think that is essentially the question. You can submit that to us. We would appreciate it. I would certainly be interested in knowing that.

[The information follows:]

COCOM was terminated at the end of March last year in favor of a new effort to establish a multilateral export control arrangement among nations with common security interests. This new effort is now being negotiated among 23 nations (the COCOM nations plus others) and is intended to be open to broader membership provided these prospective members demonstrate that they are living up to the principles of the new regime. While this negotiation is underway, however, there has been a commitment among the participating countries to maintain controls at COCOM levels and it is working. Thus, the Department of Defense programs have not been affected as a result of COCOM's termination because there continues to be broad agreement on the need for effective export controls for sensitive dual-use technologies.

Senator SMITH. These are important decisions we have to make in terms of the money we spend in future defense programs, how much we have to spend. It would be nice to know that we could slow down what everybody else is getting, so we can slow down a little bit in some of the things that we have to do and put it somewhere else where there might be something more critical.

These are big decisions and we are all laymen here and yet we are the ones that are going to have to make these decisions.

Mr. HEISER. Yes, sir. We would be happy to provide that to you for the record.

Senator SMITH. I want to thank you all for being here today. I appreciate it very much.

Senators may wish to submit additional questions for the record. We will leave the record open for 3 days.

Thank you again. The meeting is adjourned.

[Whereupon, at 4 p.m., the subcommittee was adjourned:]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1996 AND THE FUTURE YEARS DEFENSE PROGRAM

THURSDAY, APRIL 6, 1995

U.S. SENATE,
SUBCOMMITTEE ON ACQUISITION AND TECHNOLOGY,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

DEPARTMENT OF DEFENSE IMPLEMENTATION OF ACQUISITION MANAGEMENT REFORM

The subcommittee met, pursuant to notice, at 2:20 p.m. in room SR–232A, Russell Senate Office Building, Senator Bob Smith (chairman of the subcommittee) presiding.

Committee members present: Senators Smith, Bingaman, Levin, and Glenn.

Committee staff members present: Richard L. Reynard, staff director.

Professional staff members present: Jonathan L. Etherton and Steven C. Saulnier.

Minority staff members present: Andrew S. Effron, minority counsel, and John W. Douglass, professional staff member.

Staff assistants present: Pamela L. Farrell and Jason A. Rossbach.

Committee members' assistants present: Thomas L. Lankford, assistant to Senator Smith; Glen E. Tait, assistant to Senator Kempthorne; and John P. Stevens, assistant to Senator Glenn.

OPENING STATEMENT OF SENATOR ROBERT C. SMITH, CHAIRMAN

Senator SMITH. Good afternoon. The committee hearing will come to order. I apologize to the audience and to the witness for the delay. We had a vote, as you know, so we will try to make up the time as best we can the rest of the afternoon.

This afternoon, the Subcommittee on Acquisition and Technology meets to review current and proposed initiatives to further streamline the defense acquisition process. On October 13, 1994, the President signed into law the Federal Acquisition Streamlining Act. I am proud to have been a cosponsor of that legislation, regarded by many as the most important acquisition reform bill to move through the Congress in many years.

My colleague and ranking member, Senator Bingaman, deserves much of the credit for initiating of the process 4½ years ago that resulted in that landmark legislation.

As important as that legislation was, it represents only a beginning, if you will, in reforming the defense acquisition process. It remains a strong consensus that much more can and must be done if the relationship between the Department of Defense and its suppliers is to be transformed.

Unless we carry through the reform effort in the next several years we will not be able to afford to acquire the weapons systems and the services that we need to meet the national security challenges of the 21st century.

As Ms. Brenda Forman, director of marketing policy at the Lockheed Martin Corporation stated in a recent article on the subject of reform, "The process, in short, is on its way to consuming the product."

The administration has proposed further streamlining legislation for consideration in this Congress. We expect to receive proposals to amend the acquisitions sections in title X from the Department of Defense shortly.

Senator Roth, Congressman Clinger, I think Senator Glenn and others in Congress have recently introduced bills that address important issues on the reform agenda, but today we hope to survey this landscape with the witnesses and the subcommittee will shortly be considering its recommendations to the full committee concerning the Defense Authorization Act for Fiscal Year 1996.

It is my hope that working with our colleagues on the Governmental Affairs and Small Business Committees that we can also consider reform issues in a broader legislation that would apply throughout the government. I look forward to receiving suggestions from our witnesses on how to focus our attention toward areas with the highest potential payoff.

At this point, I would turn to Senator Bingaman to see if he has any opening remarks.

Senator BINGAMAN. Mr. Chairman, thank you very much, and thank you for convening this hearing. I think this is obviously a very important area of this subcommittee's jurisdiction.

I think you and I both feel very good about the acquisition streamlining bill that we did last year, feel that that was a step in the right direction. Obviously, it didn't solve the whole problem.

We did have very good cooperation from the people at the Department of Defense. Colleen Preston was a great help with that, and the acquisition reform working group, represented by Peter DeMayo at today's hearing, also was a very important factor, and GAO was as well, represented today by Robert Murphy, the General Counsel.

I think there are some areas of acquisition reform we can look at seriously this year, in addition to overseeing the implementation of this Federal Acquisition Streamlining Act, and I think one area that I hope we can get into some serious consideration of is the reform of the laws governing bid protests and post employment restrictions.

Those are two separate areas, but the bid protest area is one that I continue to hear a lot of complaints about. I think there is a lot of waste and a lot of expense required of people who want to do business with the government because of that system the way it now operates.

I think post employment restrictions is an area where the Senate has tried to do some things but has never had a lot of cooperation from the House. I hope that that might change this year, and I hope we can look again at that area.

So thank you very much for having the hearing, and I look forward to the testimony.

Senator SMITH. Thank you very much, Senator Bingaman.

Ms. Preston, welcome. You are no stranger to the Armed Services Committee. You have quite a record of service as General Counsel to the House Armed Services Committee prior to being posted at the Pentagon, so welcome.

As you are well aware, your full statement will be made a part of the record. If you could summarize it briefly, we would appreciate it.

STATEMENT OF COLLEEN PRESTON, DEPUTY UNDER SECRETARY OF DEFENSE FOR ACQUISITION REFORM

Ms. PRESTON. Thank you, Mr. Chairman, Senator Bingaman. It is a pleasure to be here to talk about the fact that we have built the best weapons systems in the world in the past, thanks to the ability and dedication of many of the people in DOD and in industry. Yet we know, however, that we were able to achieve that success not because of the system but despite the system.

We can no longer afford to fight the bureaucratic and rule-driven system. We must be able to take advantage of the professionals we have in the acquisition work force and allow them to exercise their judgment in making sound business decisions on behalf of the government.

In addition, as you are well aware, new national security challenges require us to design a more flexible, agile, and timely acquisition process capable of meeting unpredictable needs. Declining budgets require us to become more efficient and effective as well as to reduce the costs of our products and services. Finally, technology is moving and developing at such a pace, and is more often led by the commercial sector and is available worldwide, that in order to maintain our technological superiority, we must have access to that latest state-of-the-art commercial technology.

We know that DOD as an enterprise must respond to these changes in every facet of how it does business and accomplishes its mission, and the acquisition system is no exception.

The bottom line is that we must design an acquisition system that can get out in front of these changes rather than reacting to them. I appreciate this opportunity today to address why continuous improvement of the acquisition process, which the Department has been doing for years, is no longer sufficient, and why we must totally reengineer the acquisition system to improve its responsiveness, reduce costs, and to facilitate the merger of the defense and commercial industrial bases.

I would also like to tell you about a few of our accomplishments to date and a number of our ongoing acquisition reform efforts internally, since the committee has asked on many other occasions what are we doing in the Department of Defense to further the cause of acquisition reform, and then, to highlight a few issues that we desperately need your help on because they require legislative changes this session and preferably within the next few months.

Before getting into the substance of my remarks, I would just like to say that on behalf of the Secretary of Defense, the Under Secretary for Acquisition and Technology, and for all the men and women in the Department of Defense community, acquisition community, that we very much appreciate the efforts of Congress, and particularly the efforts of members of this committee, to pass the Federal Acquisition Streamlining Act last year.

We all appreciate the fact that this is not the sexiest of issues, and that the solutions are complex and often controversial, but the criticality of those reforms to those of us in the Department of Defense, in terms of reducing our infrastructure costs and avoiding reductions in the accounts that directly relate to our operational forces, is, and cannot be, underestimated. Again, I would like to thank you for your support in this area.

I would like to talk very briefly about what our acquisition reform vision, goals, and actions are, and some critical elements of a draft DOD vision statement, of the characteristics we would like to see in a reengineered acquisition system, and then outline some of the priority areas that we believe we need legislative relief on.

First of all, we have to remember that our primary goal is to meet the warfighters' needs. We cannot ever forget that meeting our customers' needs is the paramount reason for the acquisition system.

We want to become the world's smartest buyer. We want to utilize a reengineered acquisition system that encourages continuous learning, that has change as a constant, where there will be continuous process improvement, and more importantly, where there are incentives for personnel to innovate and to manage risk, rather than to avoid it, and where we also can take advantage of emerging technologies, particularly in the information management arena, to enable our business process reengineering.

Some of the actions that we have taken so far are discussed in Secretary Perry's memo on Acquisition Reform: A Mandate for Change. We are hopefully coming to closure on a new memorandum that Dr. Kaminski will sign out that will further elaborate on these goals and the Mandate for Change.

We have created just recently an Acquisition Reform Communications Center and a joint DOD team to coordinate and facilitate training of our acquisition work force. As you well know, we are going to have soon the publication of an enormous number of regulatory changes to implement the legislation adopted last year.

We know that within the Department of Defense we have over 150,000 people in the acquisition work force that we are going to have to train immediately. We will have to educate as well our vendors. We will also have to educate those who are not directly in the acquisition work force. What we are trying to do is to take advantage of all of the efforts of the services, pull it all together, and develop a strategic plan for carrying out our education and training with industry and with our overseers, so that we are all speaking from the same sheet of music.

We are attempting to come up with a number of systems right now, automated information systems, that will: assist us in tracking our major system programs; provide better tools for our acquisition personnel; implement our electronic commerce/electronic data interchange system that we must also have FACNET-compliant in order to exercise the authority that was granted us in last year's legislation to utilize simplified acquisition procedures up to $100,000.

We want to procure best value goods and services by buying from world class suppliers who are part of a national as opposed to a defense unique industrial base. That national industrial base should be composed primarily of commercial companies or dual-use suppliers who are capable of meeting our needs and are willing to sell to the U.S. Government. This is a critical part of the equation that I will talk about a little bit later, because we need the access to these suppliers in order to ensure access to state-of-the-art technology.

Some of the actions that we have taken so far to achieve this goal are Secretary Perry's memorandum of June 1994, requiring the use of performance specifications rather than military specifications. Military specifications are authorized now only if performance specifications cannot be utilized, if nongovernmental standards do not exist, and if they get a waiver or approval from milestone decisionmaking authority.

We are attempting to use commercial practices. You gave us the authority to use commercial practices not only for commercial products but for military unique items in the five pilot programs that you approved last year. We have implemented that authority, and these programs are utilizing it to the maximum extent.

We would like to establish and maintain more effective working relationships with industry, and we will soon come out with a policy memorandum from the Under Secretary of Defense for Acquisition and Technology, Dr. Kaminski, on the utilization of integrated product and process development teams and integrated product teams. We will use this concept both within the Department and also in our relationships with industry.

We also need to have a system that is timely and efficient, and is responsive to our customer's needs, one where success is judged not on the basis of whether or not an employee complied with rules or regulations, but their performance in terms of the outcome of the acquisition process—did we meet our warfighters' needs in an efficient, timely, and responsive manner.

Some of the actions that we are taking are, first of all, to utilize the authority to use simplified acquisition procedures. As you know, we cannot use that authority up to the $50,000 threshold until the regulations are in place. We are considering now whether or not we will be able to implement that regulation particularly on an interim basis so that after the public comment period is over we can start utilizing the authority immediately.

We are trying to reduce unnecessary oversight. We had a process action team that has concluded their work, after causing quite a controversy, actually, within the Department. They developed some very forward-thinking recommendations, and we have had to hash those out at some length at the very senior levels within the Department. We will be coming out soon with a memorandum from Dr. Kaminski that will state the recommendations he is approving and which should be implemented immediately to reduce unnecessary oversight in the systems acquisition arena.

We are also trying to make DOD organizations value-added team participants rather than second guessers. This is wrapped up in the concept of integrated product teams, but we have also run two process action teams, one on contract administration and one on the procurement process, that have looked at oversight of contractors primarily in the contract administration phase, and looked for opportunities where we can reduce oversight without inordinately increasing risk to the government.

We are also attempting to make sure that we are most effectively using developmental, live fire, and operational testing, in a way that makes the most sense, while utilizing technologies such as modeling and simulation, that enable us to do much more than we ever could in the past without actually testing the hardware.

The bottom line is that DOD wants to become a world class buyer.

An other impediment to our being able to accomplish that goal is government-unique rules and regulations. We received relief under FASA, the Federal Acquisition Streamlining Act of 1994, from many of these government-unique rules and regulations as I noted, for commercial products and any procurements that are under the $100,000 threshold. There are many more socio-economic provisions for which we did not get relief.

In our legislative proposals for this year, in the administration proposal that has been sent over, we again are renewing our request for relief from some of these socio-economic provisions, although not from all of them.

In addition, and I think probably the most important of the initiatives that is in the administration package, is that we get some relief from and reform of the bid protest process.

Bid protests are highly disruptive of the procurement process. As noted in a recent GAO report on information technology procurements, protested procurements take approximately 30 to 40 percent longer to award than contracts that are not protested, and over 40 percent of the information technology procurements over $25 million—in other words, all of the major procurements—are being protested today.

The administration's protest reform proposals are intended to improve the efficiency and timeliness of the acquisition process by significantly reducing the number of protests that are filed, while continuing to safeguard the interests of those who may be unfairly treated in the acquisition process.

How do we propose to do that? Basically, by establishing a uniform standard for review and uniform scope of review in all judicial and administrative fora. We believe this is the single most important provision that we have proposed in the acquisition reform legislative proposal this year.

Currently, as you are aware, the General Services Board of Contract Appeals (GSBCA), which has jurisdiction to review the preponderance of information technology protests, reviews those protests with virtually no limits on the evidence that the protesters are able to present to the board.

Protesters may come in and introduce, and agencies are required to defend their decisions in light of evidence beyond that contained in the agency's file, even if that evidence was never brought to the attention of the agency nor available to the contracting officer at the time the contracting officer made his or her source selection. This review is both costly and labor intensive, and we believe that in order to prevent this in the future, as was recommended in the investigative report that was issued by Senator Cohen in October 1994, the scope of review should be limited in law. The benefits of subjecting a deliberative decision by the agency to a review based on a new record is very detrimental to the acquisition process.

Furthermore, the GSBCA reviews these government decisions de novo, unlike the review in other administrative fora, so there is no deference provided the government's actions—the contracting officer's decision. This second-guessing standard of review is detrimental to the exercise of sound judgment by the contracting officer, particularly where an award is based on best value determinations. I will give you just one example:

In a recent Air Force IT procurement, the GSBCA upheld a protest where the source selection authority chose to rely on a protester's disastrous past performance on prior government procurements to decide that they would be better off awarding to a higher priced and technically superior offeror. The GSBCA overruled that decision.

Our estimate of the costs of defending that protest were over $100,000 in direct costs, with another $50,000 in government labor costs, legal and other, and that does not even include the GSBCA's award of protest costs to the protester, which were estimated at about $500,000, or the costs that we will incur in reprocurement of this item.

The administration's proposal would require that the board uphold a protest only if the disappointed bidder is substantially prejudiced, and either that the decision was obtained in violation of procedures established in law or regulation, or that the decision was arbitrary or capricious.

The National Performance Review has endorsed this type of review because it holds decisionmakers accountable for their actions without curtailing innovation and creativity through a fear of being second-guessed. It would also help to avoid the type of wasteful effort on protest avoidance, which I believe is probably a more critical factor than what we can actually measure because it is an insidious part of the acquisition process. People fear exercising their judgment for fear of having a protest, because the mere fact that there is a protest means that they are not providing the product to the customer on a timely basis. It also means that their decisions are being second-guessed, and no one likes to be in that position.

So it is much easier, if you are a contracting officer, to award to a low bidder that you think cannot perform, rather than exercising your judgment, perhaps awarding to a bidder that might be a higher cost but you think will provide a better value to the government in the long run, because it is easy to justify an award to a low bidder. Anything else requires some judgment on your part, and is subject to question.

In addition, we feel that providing a means for expeditious and fair resolution of protest claims through uniform interpretation of laws and implementing regulations by a single court rather than any district court will preclude forum shopping and can be accomplished by consolidating court jurisdiction in the court of Federal claims, divesting the district courts of bid protest jurisdiction.

We would also like to see the agencies given the same authority to proceed with the procurement, even if award of the contract has been protested at the GSBCA, as we are authorized to do when there is a protest lodged at the GAO. This preserves the agency's right to proceed with an urgent procurement.

The agencies are in the best position to make this determination to go ahead and award the contract, continue with performance based upon urgency or some other critical need, rather than having the GSBCA substitute their judgment for that of the agency in determining whether, in fact, there is a critical need.

We also believe that it is very important to establish a sense of Congress that agencies should develop procedures for senior level protest resolution and direct that protesters use the agency forum prior to going either to GAO or a General Services Board of Contract Appeals. If they did not exhaust their opportunity to go before the agency, they would not be authorized, then, to receive costs of pursuing their protest.

The Army Materiel Command currently has in place a voluntary senior level agency review program for disappointed bidders or offerors. Within 20 days after a protest has been filed with the agency the headquarters must make a final determination on the legitimacy of that protest. That final decision is binding on the agency and its procuring activities. During that period of time, award is withheld or work stopped on the current contract until or unless the agency exercises its authority, similar to that which we have with GAO, to override that suspension based on a critical need.

Since the inception of that program, over 290 protests have been reviewed, each in an average of 15 working days at an average government cost of only $13,886. Only 32 of these 290 decisions have been subsequently appealed to the GAO or GSBCA, and of those, 30 of the 32 were decided in favor of the Army Materiel Command. So the agency decision was overturned in only two instances, and they were able to resolve 258 of the 290 protests they received.

We would also like to see procurements under the simplified acquisition threshold utilizing the electronic commerce, electronic data interchange system, exempt from protest procedures.

These procurements are inherently, by their nature, fair. There is very little opportunity for there to be any manipulation of the process. Awards are predominantly made on the basis of low price, although they may be made on the basis of best value. The prices are made available to all offerors after the award is made, and given the relative inability for anybody to skew the procurement process, we do not believe that the cost of the bid protest process for these procurements is warranted. We would ask that they be exempted from bid protest procedures.

Senator Bingaman, you mentioned the procurement integrity issue. We believe that amending the procurement integrity law to focus on improper disclosure or obtaining of contract or bid or proposal or source selection information, rather than the current statutory focus on whether that information was disclosed or obtained by a person having the status of a procurement official or a competing contractor, would significantly simplify the application of the law yet still ensure protection of the information until contract award.

Unauthorized access to a competitor's bid or proposal information, or the agency source selection information, may provide a bidder or an offeror an opportunity to obtain an unfair advantage in competing for a government contract. The government itself, we in DOD have a substantial interest in maintaining a level playing field for all competitors for government contracts, and any perception that the process is unfair is likely to discourage potential competitors.

The net result of diminished competition in government procurements is increased cost to us, whether because of a higher contract price or less satisfactory products or performance, so we have a definite interest in ensuring that the integrity of the procurement process is maintained.

We believe that the proposed amendments that are in the administration package would provide the needed protections while ensuring that competing contractors do not obtain access to information that would give them an unfair competitive advantage. Of course, anyone who had access to that information by reason of being an employee of the United States or acting for or advising the United States would be prohibited from disclosure and subject to both criminal and civil penalties.

The third initiative that we are proposing, and one that we believe is very critical, is increasing the dollar thresholds for approvals at higher levels of justifications for other than full and open competition, and we are also proposing that agencies who conduct a high percentage of competitive acquisitions be exempt from having to make these sole source justifications at a higher level than the contracting officer.

We believe by doing this that you will provide an incentive for an agency to maintain a very high level of competitive acquisition, because as long as they do, then where an exception is warranted, a contracting officer can make that decision without having to have it approved at a higher level.

Every time you send a decision to a higher level, we lose time. Time is money in the acquisition process, and we all know that. By the same token, increasing the dollar thresholds for individual decisions, even if that agency does not have a waiver authority, will also allow our contracting officers to exercise their judgment.

The reason for higher level review is to have someone else basically review the decision of a contracting officer. Ask yourself whether or not this system is appropriate. What value does a senior level official add to this process? For the most part, they are subject to whatever information the contracting officer gives to them anyway, the information that comes up the chain of command to them, so I would purport that these officials do not, in fact, add any value to the decision-making process. Therefore their review is in effect a non-value added but very costly procedure.

We would also like to allow agencies to limit the number of offerors in the competitive range to three when the contracting officer determines that such action is warranted by considerations of efficiency. This will enable agencies to expedite the procurement process and will allow offerors who really have no chance of receiving the award to save time and money by being removed sooner rather than later in the source selection process.

As it stands now, after initially evaluating each offeror's proposals, agencies must look for a natural break in making a competitive range determination, and they have to do that under existing GAO and GSBCA decisions. If there is any question as to whether or not an offeror should be included in the competitive range, the offeror is kept in.

The result is, in order to avoid protests, agencies generally will not leave any offeror out of the competitive range unless they clearly have absolutely no opportunity or chance to win the award of the contract. We are so conservative in removing people from the competitive range at an early point in the acquisition process that we needlessly keep people a part of the acquisition process when, in fact, there is little chance that they will ever receive an award.

I would like to just address two more issues very quickly. One is small business procedures. We would like to see an amendment to the Small Business Act to authorize the SBA to permit contracting activities to award 8(a) contracts directly to a small and disadvantaged business, the eligible program participant, rather than going through SBA as a conduit. If the contracting officer or the small business would prefer to contract with SBA and then indirectly to the contracting agency, they may do so.

We think that this will streamline and simplify the 8(a) program. This delegation, the way we have structured it in the administration proposal, can be rescinded by SBA at any time. If the agency abuses the authority or uses the authority to somehow inappropriately exclude small businesses, SBA can, at any time prior to contract award, revoke the delegation of that authority and can remove that authority for the agency at any time in the future.

We believe this makes a lot of sense both on behalf of SBA and ourselves, as well as the program participants, in terms of trying to get on contract, negotiating terms and conditions, and going forward with the contract award in a very quick and efficient manner.

Finally, we believe that procurements that are in excess of the simplified acquisition threshold but are nonetheless conducted using electronic commerce/electronic data interchange, should be exempt from the notice and wait provisions that are currently in statute. Simplified acquisitions have been exempted from those notice and wait procedures based on the fact that using the EC/EDI system gives people the notice that is required and basically obviates these existing legislative requirements.

We do not see any distinction that needs to be made between small purchases and large purchases in this regard.

There are, as you have probably heard, in addition to the administration proposal, a number of initiatives that are being considered right now in OMB for approval as part of the proposed DOD authorization bill—some DOD-unique provisions, and I would like to just highlight a couple of those.

First of all, defense acquisition pilot programs. You gave us authority to do five pilot programs last year. We are asking for the authority to conduct one more pilot program, and we are working out the details of that proposal right now for one particular system.

In addition, based upon the recommendation of the Defense Science Board, we would like to ask you to consider making a pilot program out of an entire contractor facility, where a contractor can show that they will have only contracts in that facility that will be exempt from cost or pricing data requirements, and as a result of that, could do business with us on a totally commercial basis.

Where that is the case, we are proposing that we be allowed to waive all government-unique rules and regulations that might apply, and to be able to do business with the contractor on contracts that are being performed in that facility on a totally commercial basis.

In addition, we have some very minor proposals on testing that we would like to see considered. This would allow streamlining of the testing process, and allow some utilization of contractors when their impartiality can be assured. These are, again, very minor changes and something that we believe is warranted and has been agreed to by the testing community within the Department of Defense.

Finally, we have two waivers for M account requirements that would authorize two categories for which funds would remain available for obligation without time limits until the contract purpose is achieved. The reason this is necessary is that we have some unique categories of contracts where we know going in that the funds will expire long before the contractual obligations will be incurred—indemnification and warranties under our satellite contracts and shipbuilding contracts.

Mr. Chairman, members of the subcommittee, that concludes my formal statement. I would be happy to answer any questions that you might have.

[The prepared statement of Ms. Preston follows:]

PREPARED STATEMENT BY COLLEEN A. PRESTON, DEPUTY UNDER SECRETARY OF DEFENSE

We have in the past built the best weapon systems in the world, thanks to the ability and dedication of the people in DOD and industry. We know, however, that they were able to achieve this success—often not because of the system, but in spite of it. We can no longer afford to fight the bureaucratic and rule driven system we must be able to take advantage of the professionals we have in the acquisition workforce and allow them to exercise their judgment in making sound business decisions on behalf of the U.S. Government.

In addition, new national security challenges require us to design a more flexible, agile, and timely acquisition process capable of meeting unpredictable needs. Declining budgets require us to become more efficient and effective, as well as to reduce the costs of our products and services. Finally, technology is developing at an even faster pace, is more often than not led by the commercial sector, and is available to the world. To maintain our technological superiority we must have access to the latest state-of-the-art commercial technology.

DOD, as an enterprise, must respond to these changes in every facet of how it accomplishes its mission—and the acquisition system is no exception. The bottom line is—that we must design an acquisition system that can get out in front of these new challenges instead of reacting to them.

I appreciate the opportunity to be here today to address:

- why the continuous improvement of the acquisition process that has been occurring within DOD on an ongoing basis is no longer sufficient;
- what we are doing to totally reengineer the acquisition system to improve its responsiveness, reduce its cost, and facilitate the merger of the defense and commercial industrial bases;
- some of our accomplishments to date and a number of our on-going acquisition reform efforts; and finally,
- to highlight a few issues that we desperately need your help on—because they require legislative changes, this session, and preferably within the next few months.

DOD'S ACQUISITION REFORM VISION, GOALS AND ACTIONS

First, I would like to identify the five critical elements of the draft DOD vision statement of the characteristics of its reengineered acquisition system. Then, explain what legislative assistance we need to further those goals and objectives.

Meet Warfighter Needs

In addition to the more specific and actionable goals, there is one over-arching goal upon which there is no disagreement: The primary mission of the acquisition system is to Meet Warfighter Needs—we must never forget that meeting the customer's needs is paramount.

World's Smartest Buyer

The second of the five critical elements of DOD's vision of its reengineered acquisition system is to be the World's Smartest Buyer, utilizing a reengineered acquisition process that encourages continuous learning and process improvement; where change is a constant rather than an exception; where there is constant, timely, and effective communication of acquisition reform messages; where there are incentives for personnel to innovate and to manage risk rather than avoid it; and where maximum advantage is taken of emerging technologies, particularly management information systems, that enable business process reengineering and enterprise integration.

Actions taken or in the process of being implemented:

- Establishing and continuously updating a step-by-step strategic plan of action to implement and institutionalize acquisition reforms. (Secretary Perry's memorandum: *Acquisition Reform: A Mandate for Change;* Under Secretary Kaminski memorandum on Goals, Objectives and Actions to be Taken (not final at this time).
- Changing behavior by communicating a common acquisition reform message to the people we need to engage for lasting success; focusing on learning not broadcasting; promoting the use of success stories, lessons learned, incentives and recognition programs; and, getting the right message to the right audience, the right way and at the right time. (Creation of the Acquisition Reform Communications Center and joint DOD team to coordinate and facilitate acquisition workforce education and training efforts).
- Providing incentives for acquisition personnel to innovate, while providing appropriate guidance, and the benefit of "lessons learned" in the past, by redesigning the purpose and approach of both the Federal and DOD acquisition regulations and policies, so they can better facilitate the acquisition process (e.g., by encouraging risk management rather than avoidance). (Automated Acquisition Information System composed of an "Acquisition Reference Set" or "Systems Acquisition Deskbook," "Interactive Tools," and a "Catalog" or "Index;" rewrite DODD 5000.1 and DODI 5000.2; proposed rewrite of the Federal Acquisition Regulations).
- Creation of a DOD and government-wide Electronic Commerce/Electronic Data Interchange System for contracting that will provide "one face to industry," will allow vendors to interrogate the DOD database of all outstanding Requests for Quotations, etc., by using a Value Added Network of their choice. (EC/EDI Process Action Team).

Procuring Best-Value Goods and Services

DOD will Procure Best-Value Goods and Services, by buying from world class suppliers, who are part of a national, as opposed to defense unique, industrial base, composed predominantly of commercial or dual-use suppliers capable of meeting DOD's needs and willing to sell to the U.S. Government; and by using commercial practices to the maximum practicable extent, in order to ensure access to state-of-the-art technology, reduce the cost of products and services to the government, and reduce acquisition leadtimes.

Actions taken or in the process of being implemented:

- Eliminating DOD-unique product or process specifications that inhibit the purchase of commercial items or services, or dictate to a contractor how to produce a product or provide a service. (Secretary of Defense memorandum of June 1994 requiring use of performance specifications; military specifications authorized only if waiver provided by the Milestone Decision Authority).

- Use commercial practices to acquire military unique items, as well as commercial items, to the maximum extent practicable. (Pilot Programs authorized in FASA 1994).
- Establish and maintain more effective working relationships with industry use of Integrated Product and Process Teams. (Policy memorandum to be issued within the next few weeks as a result of the Oversight and Review Process Action Team report; input from the Defense Manufacturing Council meeting with DOD Program Managers, Program Executive Officers, and SysCom Commanders).

Delivering Efficiently and on a Timely Basis

DOD will establish and maintain the most timely, flexible, responsive, and efficient system, where individuals or teams are accountable for an entire process and can change the process without inordinate difficulty or delay, and success is judged on the basis of performance related metrics rather than adherence to regulations.

Actions taken or in the process of being implemented:

- Maximizing the use of simplified acquisition procedures. (FASA 1994 authorizes use of simplified acquisition procedures up to $50,000 once regulations issued; $100,000 once certified FACNET system in place at that activity).
- Improving the service and OSD milestone decisionmaking and information collection processes for major systems, commensurate with risk, dollar value, acquisition strategy, etc., to: establish appropriate levels of service and OSD value-added management, assistance, and oversight; identify appropriate issues for review; ensure that reviews occur at the appropriate time during the program; ensure that reviews foster agreement on appropriate levels of program risk; and ensure that reviews revalidate the chosen system solution to meet a needed military capability, given program risk, cost, schedule, reliability and maintainability, industrial base, and performance considerations. (Implementation of Oversight and Review Process Action Team recommendations).
- Making DOD organizations (with the exception of those whose mission is to perform inspections) value-added team participants not "second guessers" or inspectors (both in relation to other organizations in the Department, and with respect to DOD's suppliers). (Development of IPT concept policy guidance; implementation of Contract Administration Process Action Team recommendations).
- Streamlining and making more effective and realistic developmental, live-fire, and operational testing. (Minor changes in DOD authorization bill proposal; major changes not yet agreed to).
- Shifting, to the maximum extent practicable, from a management philosophy that attempts to achieve high quality and performance through after-the-fact inspection, to government review of contractor process controls and review of output. (Issuance of Secretary of Defense memo authorizing use of ISO 9000 standard in place of MilQ 9858A).
- Ensuring that DOD emulates the best procurement practices (e.g., timely, responsive, flexible and efficient) of world-class customers and suppliers including: using performance based and fixed price service contracts; rewarding past contractor performance in source selection; identifying and disseminating best procurement practice: eliminating non-value added activities—duplicative reviews, revisiting decisions, and non-hands-on labor.
- Ensuring that internal and external oversight and review are necessary to ensure compliance with enunciated policies or requirements, and are performed in the least obtrusive manner necessary to add value to either the overall process or the particular acquisition, consistent with the risk of impact to the government in the absence of such oversight and review. (Implementing recommendations of Contract Administration PAT).
- Eliminating functional stove-pipes and replacing them with integrated decision teams that provide the necessary cross-section of functional "expertise" and organizational input to address and resolve acquisition issues at the lowest possible management level.
- Updating laws regarding foreign contracting and contingency operations, the lending/borrowing of defense equipment, and "war risk" to contractor personnel. (Proposed to be added to FASA 1994; will be resubmitted in fiscal year 1996 DOD authorization bill).
- Establishing clear process and outcome (performance-related) measures to determine success of change efforts. (Reconstitution of Pilot Program metrics group to address all metrics, with the assistance of other organizations in particular fields, such as the Standards Improvement Council).

Balancing Cost of Protections and Application of Socio-Economic Objectives

Eliminating, to the maximum extent practicable, government unique terms and conditions, unless that particular aspect of the buyer-seller relationship is not adequately "regulated" by market forces; the financial and ethical integrity of the government acquisition process is not adequately protected; or, the furtherance of national domestic policies justify the use of a government-unique term or condition. If so, there should be a better balancing of the risk of abuse of the process and the benefits of socio-economic gains to be achieved, with the cost of compliance with government-unique rules for both the government and industry.

- Proposing and working for the adoption of exemptions to the application of government unique rules and regulations from commercial products and purchases under the simplified acquisition threshold.

ADMINISTRATION PRIORITY ITEMS FOR 1995 LEGISLATIVE ACTION

There are a number of legislative changes the Department believes are critical to its continuing efforts to re-engineer its acquisition processes and attain the vision outlined above. I have included in my written testimony an explanation of as many of the proposals in the administration request, and those proposed for inclusion in the Fiscal Year 1996 National Defense Authorization Bill as possible. Today, I would like to highlight for you only the priority issues.

Protest Reform

The most critical issue to the administration, including DOD, is to reduce the number of bid protests. Bid protests are highly disruptive of the procurement process. As noted in a recent GAO report on information technology procurements, protested procurements take approximately 30–40 percent longer to award than contracts that are not protested, and almost 40 percent of the governments information technology contracts are protested. The administration's protest reform proposals are intended to improve the efficiency and timeliness of the acquisition process by significantly reducing the number of protests that are filed, while continuing to safeguard the interests of those unfairly treated in the acquisition process.

- Establishing a uniform scope and standard of review in all judicial and administrative protest fora is the single most important proposal in the protest area.

Currently, the General Services Board of Contract Appeals (GSBCA), which has jurisdiction to review the preponderance of information technology (IT) protests, reviews protests with virtually no limits on the evidence that protesters are able to present to the Board. Protesters are allowed to introduce, and agencies are required to defend their decisions, in light of evidence beyond that contained in the agency's file, even if such evidence was never brought to the attention of the agency nor available to the contracting officer at the time the decision was made. This review is both costly and labor intensive. Suggestions to reform the IT protest process made in a recent Senate report (see *Computer Chaos: Billions Wasted Buying Federal Computer Systems,* Investigative Report of Senator William S. Cohen, October 12, 1994) called into question the benefits of subjecting a deliberative decision by the agency to review based on a new record hastily created in an adversarial proceeding.

Furthermore, the GSBCA reviews government decisions de novo and, unlike review of agency actions in other fora, gives little if any deference to the government action. This "second guessing" standard of review is extremely detrimental to the exercise of sound judgment by a contracting officer, particularly where an award is intended to be based on a "best value" determination. For example:

- In a recent Air Force IT procurement, the GSBCA upheld a protest where the Source Selection Authority chose to rely on the protester's disastrous past performance on prior government contracts to decide to award to a higher priced and technically superior offeror. The government's estimated costs of defending that protest included over $100,000 in direct costs, with another $50,000 in government labor costs (legal and other). These amounts do not include the award of costs to the protester (estimated at $500,000) nor the costs that will be incurred by the government in conducting a reprocurement.
- In *B3H Corp. v. Department of the Air Force* (July 8, 1994), a 15 percent price differential was weighed against technical superiority and the decision was made to award to the technical superior offeror. All five technical factors weighed in favor of the awardee. The Board found that the evaluation of one technical factor lacked a rational basis and, on that ground alone invalidated the award, notwithstanding the fact that the solicitation had listed technical as the most important factor. The result of this decision is that agencies are forced to quantify the technical superiority of the higher rated offeror, where it is higher in price, which is difficult, if not

impossible, to accomplish. This decision is on appeal and the final costs are therefore not ascertainable.

The administration's proposal would require that the Board uphold a protest only if the disappointed bidder is substantially prejudiced and either (i) the decision was obtained in violation of procedures required by law or regulation, or (ii) the decision was arbitrary or capricious. The National Performance Review has endorsed this type of review because it holds decision makers accountable for their actions, without curtailing innovation and creativity through a fear of being second-guessed. It would also help to avoid the type of wasteful effort on protest avoidance (extensive agency documentation and quantification of decisionmaking process) that the Senate report found was occurring in IT acquisitions.

- Providing a means for expeditious and fair resolution of contract protests (and claims) through uniform interpretation (by a single court, rather than any district court) of laws and implementing regulations precludes forum shopping, and can be accomplished by consolidating court jurisdiction in the Court of Federal Claims and divesting the district courts of bid protest jurisdiction.
- Giving agencies the same authority to proceed with a procurement even if award of the contract has been protested at the GSBCA (just as they have at the GAO) preserves the agencies' (who are in a better position to know the urgency of their requirements) authority to proceed with the acquisition while a protest is pending when the agency determines that it is in the government's best interests.
- Directing that dispositive motions must be decided prior to a hearing on the merits, would enable agencies to minimize delays in the delivery of program benefits by requiring both the GAO and GSBCA to decide dispositive motions before proceeding with a full hearing of the protest on its merits.
- Giving agencies authority to bring interlocutory appeals to correct erroneous GSBCA rulings on three types of dispositive motions (that the procurement is not subject to the Brooks Act, the protest is not timely filed, or the party filing the protest is not an "interested party") instead of waiting for a determination of the protest on its merits.

Currently, agencies must wait until the protest is decided on the merits before obtaining a ruling on agency motions that would otherwise dispose of the protest. As a result, protests are often unnecessarily prolonged as discovery continues and the merits are heard, briefed and decided. In addition, even where a dispositive motion has been decided by the GSBCA, an agency is unable to seek judicial review of that decision until a final decision is made on the merits of the protests. The effort needed to obtain a ruling on a dispositive motion or seek judicial intervention on any of these three issues is very small when compared to the resources the parties must expend to conduct full discovery and proceed on the merits, particularly before the GSBCA. By requiring early decision on and allowing early judicial resolution of dispositive issues, these provisions will save all parties concerned considerable time and money in addition to minimizing unnecessary delays in the achievement of agency program goals.

- Declaring a Sense of Congress that agencies should develop procedures for senior level protest resolution and directing that protesters use the agency protest procedure, if available, before costs could be awarded by another forum would guarantee fast, cost and effective resolution of protests.

The Army Material Command has currently in place a voluntary senior level agency review program for disappointed bidders or offerors. Within 20 days after a protest has been filed with the agency, the agency headquarters must make a final decision on the legitimacy of a contract award. That final decision is binding on the agency and its procuring activities. During this process, award is withheld and work stopped unless there is an agency override. Since this program's inception, 290 protests have been reviewed in this venue, each in an average of 15 working days at an average government cost of $13,686. Only 32 of these AMC decisions have been appealed to the GAO or GSBCA. Of those, 30 were decided in favor of AMC.

- Frivolous protests by contractors could be reduced by authorizing GAO to recommend, and GSBCA to direct, an award of costs to the government when a contractor files a frivolous protest.

Since GAO may not direct an executive agency, guidance will be added to the FAR to permit an agency head to initiate action to collect payment from a contractor based upon a GAO recommendation.

- Requiring that the Federal Acquisition Regulation be amended to disallow those costs incurred in preparation, filing, or pursuit of a protest, including attorneys' fees and consultant and expert witness will prevent unsuccessful protesters from being able to recoup their protests costs by including such costs in their indirect overhead accounts on other government contracts.

- Permitting offerors to agree not to protest a procurement diminishes the disadvantage incurred by companies that, as a policy matter, refrain from protesting agency errors that do not invalidate the basic rationale for the agency's contract award decision even though other companies adopt the strategy of protesting every government error no matter how insignificant.

The refraining companies have adopted a broader perspective that considers the costs of such a strategy—in terms of legal fees, longer acquisition lead-times, and reduced government buying power, and determined that they far outweigh the benefits of harassing their competitors or reversing a few awards they might otherwise have lost. The refraining companies want to focus their efforts on achieving competitive advantage through improved product design, innovation and value rather than through legal argument. This proposal allows offerors to agree to refrain from protesting decisions favoring other offerors as long as those other offerors have also agreed to refrain from protesting. An offeror's decision to sign-up or not to sign-up to the agreement to refrain from protesting will not be taken into consideration in evaluating its proposal.

- Exempting procurements under the Simplified Acquisition Threshold and made on FACNET from all protest procedures would reduce acquisition costs by reducing lead time and government personnel necessary to respond to protests.

Procurements using Simplified Acquisition Procedures and the FACNET include inherent safeguards that make abuse of the process almost impossible. Given the limited ability to skew such procurements, the cost of the bid protest process (including the behavior it causes in contracting offices) is not justified.

Procurement Integrity Reform

- Amending the procurement integrity law to focus on the improper disclosure or obtaining of contractor bid or proposal or source selection information, rather than on whether the information was disclosed or obtained by a person having the status of a "procurement official" or a "competing contractor" would significantly simplify the application of the law yet still ensure protection of the information until contract award.

Unauthorized access to a competitor's bid or proposal information or the agency's source selection information may provide a bidder or offeror an opportunity to obtain an unfair advantage in competing for a government contract. The government has a substantial interest in maintaining a level playing field for all competitors for government contracts and any perception that the process is unfair is likely to discourage potential competitors. The net result of diminished competition in government procurements is increased costs to the government, whether because of a higher contract price or less satisfactory products or performance. The proposed amendments would provide needed protections to ensure that competing contractors do not obtain access to information that would give them an unfair competitive advantage and, thereby, jeopardize the integrity of the procurement process.

Anyone who had access to that information by reason of being an employee of the United States or acting for or advising the United States with respect to the particular procurement would be prohibited from such disclosure and subject to both criminal and civil penalties for violations.

Empowering Line Managers (Contract Award Items)

- Increasing the dollar thresholds for approvals at higher levels of individual Justifications for Other than Full and Open Competition, and exempting agencies that conduct a high percentage of competitive acquisitions from having to get sole source justifications approved at higher organizational levels as long as they maintain these high standards, would provide an incentive for agencies to maintain high levels of competition, and would allow front-line procurement professionals to exercise their judgment without the fear of constant second guessing by higher level officials.

Note: Levels for DOD are different than for the civilian agencies because they are set to coincide with approval authorities for major defense systems, and in recognition of the higher value contracts let by DOD organizations with the same titles as civilian agency organizations.

- Vesting the authority for making certain contracting decisions (e.g., using qualification requirements, and waiving cost or pricing data requirements in certain circumstances, etc.) in the contracting officer will empower front-line personnel, and eliminate paperwork and other substantial administrative burdens associated with higher-level approvals.
- Allowing an agency to begin a procurement by soliciting product information based on a statement of what the agency believes are its needs and then to tailor that solicitation based on information provided by offerors concerning the capabili-

ties of their products and their suggestions on how the agencies' needs can best be met would increase greatly agencies' ability to gain ready access to products and technologies in the commercial market; give contracting officials a very effective means for obtaining the information required to identify suitable commercial products available; and to acquire the best value product or service within reasonable timeframes.

This proposal would allow agencies to obtain products suitable for their needs without over-specifying. Developing specifications that address every product characteristic necessary to ensure suitability is difficult, time consuming and futile given the fast pace of product evolution that occurs in today's commercial market. Inevitably, the resulting specifications unnecessarily limit competition by barring suitable alternative and innovative designs.

- Allowing agencies to limit the number of offerors in the competitive range to three when the contracting officer determines such action is warranted by considerations of efficiency, would enable agencies to expedite the procurement process, and will allow offerors that do not have a real chance of receiving award to save time and money by being removed sooner rather than later in the process.

After initially evaluating each offeror's proposal, agencies now, according to General Accounting Office (GAO) and General Services Administration Board of Contract Appeals (GSBCA) decisions, must look for the "natural break" in making a competitive range determination. If there is any question as to whether an offeror should be included in the competitive range, the offeror is kept in the competitive range. The result is that, in order to avoid a protest, agencies generally will not leave any offeror out of the competitive range unless that offeror clearly has no chance whatsoever of being awarded the contract. Thus, many contractors who have no real chance of winning the award continue to incur bid and proposal costs, and the government if forced to expend precious resources evaluating bids that have no chance of winning.

- Requiring that an offeror request a debriefing within 3 days of receiving notice that the offeror has been removed from the competitive range will increase efficiency and better maintain the integrity of the source selection process by giving the agency the opportunity to decide to debrief the offeror at that time or after contract award, whichever is most appropriate given the particular acquisition.

Logically, a competitive range cut is when an "adverse decision" has been made as far as the offeror is concerned. Therefore, it should start the offeror's time running for requesting a debriefing. The 3 day window to request a debriefing provided for in this paragraph is identical to the 3 day window provided for other offerors under the Federal Acquisition Streamlining Act (FASA) and codified at Title 10, United States Code, Section 2305(b)(5). The agency should retain the flexibility to give an immediate debriefing or to wait until after contract award. The offeror's time to protest would not begin until after the debriefing occurred.

- Authorizing the establishment of two-phase selection procedures, and award of a single contract for design and construction, lease-construction, or information technology procurements, etc., that require substantial system design or integration work, would be more efficient in certain instances.

This proposal would add a new section to Title 10 authorizing two-phase selection procedures, and the award of a single contract, as an alternative to the traditional approach of a contract for design services followed by a separate contract for construction or other services. Agencies would be authorized to use two-phase selection procedures for acquiring the design and construction ("design-build") of a public building, or other work of a similar nature, when certain criteria are met. The "two-phase" approach to project delivery involves awarding a single contract for design and construction.

Streamlining Small Business

- Amending the Small Business Act to authorize SBA to permit contracting activities to award 8(a) contracts directly to small and disadvantaged business firms (eligible program participants) unless the contracting officer or the small and disadvantaged business firm specifically requests the SBA to be a signatory to the contract would significantly streamline and simplify the 8(a) program.

This delegation need not affect any other assistance that SBA offers to small and disadvantaged businesses. In addition, SBA would be able to revoke the delegation, at any time prior to the issuance of the solicitation, if such an action is determined to be in the best interest of the program or the small and disadvantaged business firm.

Under current law and regulations, contracts are awarded to small and disadvantaged businesses under the 8(a) program of the Small Business Administration

(SBA) by the contracting activity awarding a contract to the SBA and SBA awarding a subcontract to the small and disadvantaged business. Normally, both the contract and the subcontract contain or reference a "tripartite agreement" which, among other things, permits the contracting activity to bypass the SBA for most contract administration matters and gives the small disadvantaged business the benefit of the "changes" and "disputes" clauses.

SAT/FACNET/Procurement Notice

- Exempting a contracting activity from the requirement to delay award until 15 days after publishing a solicitation, if a prior synopsis provides all of the information required to be in a CBD solicitation notice, would streamline the procurement process by eliminating unnecessary actions, save time, and enhance responsiveness to their customers.

This proposal gives contracting officers flexibility to compress solicitation timeframes when business needs and marketplace support doing so.

- Exempting procurements above the SAT, if accomplished on FACNET, from the procurement notice synopsizing requirements, and permitting the establishment of flexible wait periods before contract award, will greatly streamline the procurement process in terms of time and resources required.

DEFENSE UNIQUE PROPOSALS BEING CONSIDERED FOR INCLUSION IN THE ADMINISTRATION'S PROPOSED FISCAL YEAR 1996 DEFENSE AUTHORIZATION BILL REQUEST

Defense Acquisition Pilot Programs

Sound management of our Defense acquisition programs is inhibited by a myriad of laws and regulations which are not applicable to the commercial sector. Authority to use pilot programs to test relief from these requirements is essential to shift to commercial item acquisition and practices by DOD.

This proposal expands the range of statutory waivers available to FASTA-authorized pilot programs to:

— Permit decisions concerning developmental and operational testing to be made by the milestone decision authority (MDA) not by the OSD OT&E Director;

— Allow use of standard commercial warranties against manufacturer's defects;

— Allow program status reports in a format set by DOD regulation; (vice unique Selected Acquisition Report/Unit Cost Report formats);

— Eliminate the separate manpower analysis; and,

— Allow the independent cost estimate to be done at MDA level (vs. OSD CAIG).

It also authorizes one new system, and one facility, pilot program.

Testing

The testing process must be streamlined to produce greater testing efficiency and affordability when procurement accounts are being drastically reduced, and the Secretary of Defense authorized to expand the use of contractors if impartiality is assured.

This section makes minor clarifications, authorizes testing methods that would make more efficient use of diminishing RDT&E and Production funds, and better utilizes the expertise of contractor personnel (i.e., the system contractor would be allowed to provide analytic and logistics support; a contractor could support both developmental and operational test analysis; but could not establish criteria for data collection, performance assessment or evaluation activities).

Waivers from Cancellation of Funds ("M Accounts")

Would authorize two categories for which funds will remain available for obligation (without time limit) until the contract purpose is achieved.

— Satellite incentive fees (funds available until fee is earned).

— Shipbuilding (funds available for contract price adjustments, close-out costs, settlement of claims, etc.).

Competitiveness of United States Companies

Many manufacturers of weapons systems for the DOD rely on FMS to keep their production rates at an efficient level, benefiting DOD and the taxpayer by keeping unit prices low. However, these manufacturers must be able to compete fairly on the world market against foreign manufacturers.

This proposal would repeal the requirement to recoup non-recurring R&D charges on products sold through the Foreign Military Sales program.

Defense International Agreements

International military and other cooperative efforts are more frequent and more diverse in nature in the post-Cold War era; policy on use of international agreements should be clear and should include consideration of effect of agreements on U.S. industry.

Establishes requirements regarding, and clarifies how defense international agreements are made and implemented.

Offset Policy

The Secretary of Defense should be informed about excessive offset arrangements in foreign military sales so that an adequate U.S. technology base may be preserved.

Consolidates existing language defining offset policy and adds reporting requirement for U.S. firms that contract to sell a weapon system or defense-related item to a foreign country or firm if the contract is subject to an offset arrangement greater than $50 million.

Cooperative Projects

The Secretary of Defense should have complete authority to conduct cooperative projects, particularly where international actions are more frequent and more diverse in nature in the post-Cold War era.

Consolidates existing 10 U.S.C. 2350a and 2350b; eliminates the need to cross-reference the Arms Export Control Act.

Cooperative Logistic Support Agreements

More effective use of U.S. facilities must be achieved as their workload decreases. Permitting organic DOD depots to compete for NATO Maintenance and Supply Organization (NAMSO) is critical to that goal.

Incorporates existing 10 U.S.C. 2350d into new consolidated defense trade chapter in Title 10, with changes to permit organic DOD depots to compete for NATO Maintenance and Supply Organization (NAMSO) work on a cost reimbursement basis.

Loan of Materials, Supplies, and Equipment for Research and Development Purposes

Greater flexibility in international military efforts, especially authority to make or accept loans from friendly foreign countries, is necessary where international actions are more frequent and more diverse in nature in the post-Cold War era.

Incorporates existing 22 U.S.C. 2796d to consolidate laws relating to international cooperative programs in Title 10; changes "NATO or major non-NATO ally" to "friendly foreign country" to expand the Secretary of Defense's authority to make or accept these loans.

Exchange of Personnel

Enhanced international communications and better international working relationships are critical to the DOD's ability preserve peace in the post-Cold War era.

This proposal provides statutory authority to exchange personnel between DOD and Foreign Defense Departments or Ministries.

Acquisition, Cross-servicing Agreements, and Standardization

Greater flexibility in international military efforts is necessary where these actions are more frequent and more diverse in nature in the post-Cold War era.

This proposal relocates statute to a new consolidated chapter; retains statutory provisions on acquisition and cross-servicing agreements; adds provisions on operational and burdensharing agreements, and NATO standardization.

Procurement of Communications Support and Related Supplies and Services

Greater flexibility in international military efforts is necessary where these actions are more frequent and more diverse in nature in the post-Cold War era.

Consolidates 10 U.S.C. 2350f with an amendment to permit the furnishing of temporary reciprocal communications support, and supplies and services, without formal agreement for not longer than 90 days.

Authority to Accept Contribution

Greater flexibility in international military efforts is necessary where these actions are more frequent and more diverse in nature in the post-Cold War era.

Consolidates 10 U.S.C. 2350g with an amendment to permit direct payment or contribution from a foreign country in accordance with a mutual defense agreement, to be credited to appropriations available for that fiscal year.

Standardization of Equipment with NATO Members

Standardization with NATO is of increasing importance because of greater international cooperation in post-Cold War era.

This proposal relocates a statute to a new consolidated chapter and adds certain reporting requirements.

Policy Objectives Relating to Defense International Trade

Policies related to coordination between domestic defense acquisition practices with both defense trade and cooperation and foreign military sales and assistance must be clearly stated because the post-Cold War era will see greater reliance and emphasis on defense trade and cooperation.

This proposal would establish an express congressional policy that the U.S. attain national defense technology and industrial base objectives by fully coordinating domestic defense acquisition practices with both defense trade and cooperation (Chapter 173) and foreign military sales and assistance (Title 22).

Senator SMITH. Thank you very much, Ms. Preston.

Senator Levin, do you have any opening remarks?

Senator LEVIN. I will withhold that. Thank you very much, Mr. Chairman.

Senator SMITH. I was somewhat amused by one of your very first remarks when you said we seem to do very well building weapons systems despite the system. I have thought of that myself many times, as we have talked about the streamlining. It seems over the years, ever since I have been in the Congress, we have always heard of the need for streamlining, and obviously there is, but it does make you pause and think about it in the sense that we have been pretty doggone successful, in spite of the problems, in producing the best weapons in the world, so it might not be a perfect system, but it has worked, and I think in terms of reforming it we want to make sure that those reforms are positive, obviously.

You went through an awful lot of things there and covered a lot of ground in your remarks. In terms of the committee here, and the Senate specifically, there are several legislative initiatives out there now for reform. Could you just rank what you would like to see come out of those legislative initiatives that are out there, as well as your own thoughts on the initiatives?

You don't have to go back and cover all the things you talked about, bid protests—some are obvious—but rank them in the top five. Do you want bid protests number 1? What would you like to see, 1, 2, 3, 4, 5?

Ms. PRESTON. There is actually one thing that I did not mention, and that is that we have several technical corrections to last year's bill, one of which we believe is precluding us from really utilizing the small purchase authority and credit card payments, and we would like to see if we might get some signal that if we brought you a legislative proposal that that might be considered very quickly in order to let us completely fulfill the authorities that you have granted us last year.

But bid protest, I think as you mentioned, is number 1 on our priority list. That is something, as I said previously, that really pervades the acquisition process. We would like to see in DOD obviously the opportunity to utilize the pilot programs. They are proving to be one of the most successful venues that we can utilize in the department, because even when we cannot convince people that the principles are correct in terms of acquisition reform, we can then go out and test it and prove to people that it works. That breaks down a lot of barriers for us in terms of making the change in the process itself.

We obviously are very concerned about some of the other initiatives relating to bid protests in terms of the forum. Having more than one forum is difficult for us, because it results in additional or differing opinions in many cases, and that causes quite a bit of confusion in terms of what our policies and procedures are.

Senator SMITH. Just one more would be fine. We are getting the idea here, I think. You mentioned the credit card thing. Those are the kinds of things we need to know.

The problem is that we have not really seen the act implemented yet, for the most part, so we have not had a chance to evaluate it. We have to be a little cautious about coming back with a whole wave of new things until we get some sense of what is going on.

Ms. PRESTON. There are some things that were not even addressed last year that we are asking for consideration this year. One is in the international trade area.

There was an entire chapter of the section 800 report devoted to international trade, and simply because of its complexity and the time that we had last year, we did not have an opportunity to really discuss that or go into any detail with either the Members or staff last year. We would like to see that pursued this year and hopefully get that out of the way. That is one of the other significant areas of section 800 reform initiative that has not been addressed.

And then, of course, procurement integrity, which we again really did not have an opportunity to explore.

Senator SMITH. Would you rank an increase in the dollar threshold up there pretty high?

Ms. PRESTON. Yes, I would. I would, because it sends a signal to the acquisition community that we trust people to do their jobs. We are spending a lot of time and money in training people. We are requiring people to go back to school to get college degrees if they do not have them. These are people who have been in the system for 20 and 25 years in some cases, and we are forcing upon them all of these new criteria in terms of education and training in order to get promoted, et cetera, and I think that we owe them a sign of good faith.

Senator SMITH. If we streamlined the acquisition process at the Pentagon, do you see a reduction in acquisition work force personnel in the Pentagon? If so, how many? Let us say, over the next 5 years.

Ms. PRESTON. Over the next 5 years we have already projected a decline in the acquisition work force of about 11 percent. If you carry that out to the year 2001, it becomes, I believe, about a 19 percent reduction, but I should say that as of 1993, we were already back to the level that we were in 1980, so the acquisition work force has already declined and that decline is being driven by budgetary considerations rather than process changes.

What we are seeing is that we have taken the people out but we have not changed the processes enough, and we have not given them enough of the tools, like information resources, to be able to accomplish their jobs, so we are just getting further and further behind. That is the result.

Senator SMITH. My time has expired. One final point before I turn it over to Senator Bingaman. Not all in personnel savings, but Secretary Perry has indicated he thought by the year 2001 we could save about $3 billion in acquisition reform. Do you basically concur with that?

Ms. PRESTON. Of course. I would agree with anything the Secretary has said.

Senator SMITH. Just checking.

Ms. PRESTON. Let me just elaborate a little bit further on that. We have great difficulty in trying to give you figures on acquisition reform savings for a number of reasons. We are going to start working very hard this year in trying to establish metrics to actually calculate what the savings would be, but, for example, the services are streamlining their systems acquisition process as we speak. They are already coming in with zero mil specs on many of their major weapons systems.

We do not know what the cost savings is, because unless we require the contractors to bid on the initial draft Request for Proposal (RFP) the old standard format or, if we are lucky, we have a previous price on an item, we do not have any way to compare what the price would have been using the old procedures, versus what it would be using the new procedures. So we are guessing at this point.

Senator SMITH. Thank you. Senator Bingaman.

Senator BINGAMAN. Thank you, Mr. Chairman. First let me congratulate Colleen on this presentation and indicate that I see this as a major contrast with what we usually historically have received from the administration in the way of recommendations for acquisition reform. Usually, we get a bunch of vague statements about how we ought to give the Department more authority to waive things.

I think this is a very constructive set of recommendations. I hope we can act on many of these. One area that I have heard a lot of complaint about is acquisition of information technology, computer acquisition. As I understand the situation now, DOD cannot purchase most types of computer equipment unless it receives a delegation of procurement authority, referred to as a DPA, from the GSA. I would like your comment as to whether that still makes sense, having that requirement. Should we eliminate that requirement and have DOD departments and agencies given authority to go ahead and procure computer equipment within a certain set of guidelines without GSA's involvement?

Senator SMITH. Excuse me one moment. I apologize. We do have a recorded vote. I think I will go ahead and run over and vote, and we can keep going and we will not have to interrupt the witnesses. Excuse me.

Ms. PRESTON. Thank you. Yes, Senator Bingaman. We believe that the value added of the GSA review is very little. In fact, if you look back historically at the requests for delegation of procurement authority where they have come back and asked for a change in the process that the agency proposed, we had very few instances of that occurring.

When the Brooks Act was enacted, it was done with the intent of trying to make sure that the government was able to utilize the economies of scale of purchasing large amounts of information technology equipment and therefore it did not make any sense to have the Navy buying equipment, GSA buying equipment, et cetera. So the effort was to consolidate all of that by having one agency review how the purchases were occurring, and also to look for opportunities where there could be savings, et cetera.

The industry has changed phenomenally, and in fact there are virtually no products that we purchase today that do not have some computer capability in them, ranging from medical supplies to black boxes that we put in our major weapons systems.

The question is—and I think it is a question we have to ask ourselves, every time there is another agency involved or another layer of review—does that review add any value to the process. We fail, frankly, to see any value in the GSA process now.

Senator BINGAMAN. Okay. Also on this computer acquisition, as I understand it, for noncomputer acquisitions, GAO serves as the forum for bid protests, primarily.

Ms. PRESTON. Yes, sir.

Senator BINGAMAN. For most computer acquisitions, the General Services Board of Contract Appeals (GSBCA) serves as the protest forum. GAO has a fairly informal procedure. The GSBCA operates in much more of a formal trial situation.

In your view, does that make sense? Should we keep that GSBCA bid protest process for computer acquisitions?

Ms. PRESTON. We would prefer to have one forum for bid protests, and that forum be GAO. Again, the GSBCA was created as a part of the Competition in Contracting Act of 1984, based upon a concern that GAO did not provide a fair forum for contractors. I think that for people to argue that situation now, they would be very hard pressed to substantiate that GAO is not an adequate forum for the resolution of bid protests.

The other argument made for GSBCA hearing bid protests is that they have a particular expertise and knowledge of information technology acquisitions. There is no reason that there could not be a group within GAO that also had that knowledge and expertise.

Senator BINGAMAN. Your proposal that we consolidate all judicial review of bid protests in the Court of Federal Claims, you think that is a significant and priority change we ought to make?

Ms. PRESTON. Yes, sir, I do. Right now, we get a lot of forum shopping. We are subject to suit in any district court throughout the country. Most of the district courts are not familiar with government contracts, and as a result, we get wide-ranging differences in opinions. That causes a considerable amount of confusion in trying to adopt policy or even to figure out which way we are supposed to proceed when we have conflicting decisions.

Senator BINGAMAN. We are half-way through a vote. I guess I will go ahead.

Senator LEVIN. I will just try 1 minute and then I will run.

Senator BINGAMAN. Then we will be back. Do not leave.

Senator LEVIN. Let me add my welcome, Colleen.

Ms. PRESTON. Thank you, Senator Levin.

Senator LEVIN. First, we adopted a fairly comprehensive acquisition bill last year, the Federal Acquisition Streamlining Act, and you are now in the process of implementing that act, or moving to final regulations.

Now, there is a number of additional acquisition reform bills that are pending. We have got the administration-proposed bill entitled, "The Federal Acquisition Improvement Act." Senator Roth has a bill entitled, "The Acquisition Management Reform Act." Senator Cohen has stated his intent to introduce a bill relative to the purchase of computer products. I have introduced a bill to try to make it easier to order small commercial items by automating the GSA's multiple award schedules. That will make commercial product acquisition a lot easier.

So there is a lot going on in this area, even though we have just made a major overhaul in the area, and I was just wondering whether we should not, at least with regard to issues that we have already addressed, go slow to let the community digest what we have done and what the regulations are going to be like. We still have not figured out the final regulations, and I am just worried that we may be moving in areas that we just recently moved, and it may be confusing and overlapping.

I am wondering your thoughts, briefly, on that.

Let me just express a concern on that regard and not ask your thoughts, because I will miss the vote if I do that. The question I do have, very briefly, though, is this: on the procurement integrity reform issue, this has been a subject of some concern, the ethics laws in this area, and I think we should have very tight laws, and there is reason to have tighter laws in this area than there is in some other areas.

In your prepared testimony you say, "Procurement Integrity Reform," and then you have got about there in the middle of the page, you talk about amending the integrity law to focus on certain things. Is that highlighted proposal the only changes that you are proposing in the ethics laws relative to procurement?

Ms. PRESTON. That is the only proposal we are making to the procurement integrity statutes in the DOD authorization bill. We are considering proposing a repeal of the DOD-unique revolving door statutes.

Senator LEVIN. That is what I am worried about. Are we going to get some testimony on that?

Ms. PRESTON. Yes, sir. We have not gotten approval for the submission of our DOD-unique proposals from OMB, and until we do that I cannot really say anything.

Senator LEVIN. I would pass along some real concern on the part of this Senator to revamping those laws without very careful consultation in advance. We have just worked too hard to tighten up these laws in this area, where we have had abuses, and before we do that, before we get a proposal from the administration, I would like to consult with you on that.

Ms. PRESTON. I would be happy to do that. Thank you.

Senator LEVIN [presiding]. I think we will recess. [Recess.]

Senator SMITH. The committee will come back to order.

All I can say is, I tried with the family-friendly to get through this stuff so we would not have votes interrupting hearings, and it did not work, so I have given up. I think everybody else has, too. I apologize to the witness.

Ms. Preston, let me just ask a couple more questions. I assume Senator Bingaman and perhaps Senator Levin may be back.

What is the price we pay for these government-unique requirements in procuring goods and services? Is it an unreasonable premium?

Ms. PRESTON. Well, I think the Secretary would say that any premium is an unreasonable premium, given today's budgetary constraints, but we do finally have verifiable data developed using activity-based cost accounting methods, within various corporations that provided similar products to both commercial and government.

We looked at three different situations—companies that produced both the commercial product and the government product on the same production line, where they did it on two separate lines in the same facility, and where they produced the two products in two different facilities. It turned out there was really not much difference between the different types of facilities.

The differences really ranged in terms of what the product was, but the average cost premium of doing business with the government turned out to be in excess of 18 percent, and that was primarily due to the top 10 cost drivers, as we call them. Number 1 was our Mil Q9858A, which is our quality assurance standard. The Secretary of Defense signed out a memo about 6 months ago authorizing the use of the international standard ISO 9000 in place of the quality assurance military specification, so that should make a big difference as companies adopt ISO 9000. We did not make it mandatory. It is something that they can choose to adopt.

The number 2 cost driver was the requirement for cost and pricing data, which you provided some relief in last year's Federal Acquisition Streamlining Act, and we are now in the process of getting comments in and trying to draft the final regulation to implement those changes. Again, we hope to see a big difference as a result of that.

Senator SMITH. What are we doing to prepare acquisition professionals within the government in this new reform movement? Are we educating them to this new environment?

Ms. PRESTON. Well, if I said yes right now, that would not be appropriate, but we are developing a plan to go out as soon as we end the public comment period on all of the new regulations.

We felt it was inappropriate to go out and train people when we did not know what the final language would be, and we certainly did not want to convey to the public that we would be teaching people something where they had not even had a chance to have their comments considered. As a result, we are looking at the timeframe starting the 1st of July as the date on which we will have all of the regulations out in final form, and the 30-day period starting in which they would be effective.

We may have to delay longer than that in terms of the effectiveness of the provisions in order to get the training done, but we are expecting at that time to go out in a blitzkrieg fashion all across the country with training that will give everybody an initial set of materials and explanations of the regulations, et cetera. We will then follow that up with more in-depth training.

So we are planning for it. It is coming in stages. We are already doing training for industry, primarily small businesses, on our electronic commerce/electronic data interchange initiative and we are doing some training right now on specifications and standards, but we do not have a formalized plan in place until the regulations are final.

Senator SMITH. Here comes a tough one. Would you support increasing the threshold on Davis-Bacon?

Ms. PRESTON. The administration does not have a position on that.

Senator SMITH. Would it save money?

Ms. PRESTON. I have seen studies that have shown that in fact money would be saved if the threshold were increased. I cannot tell you where I have seen those in the trade press. I do not know how valid they are, but I know I have seen articles that purportedly showed savings to be achieved.

Senator SMITH. So if we passed Davis-Bacon reform, would the administration take a position on it? Would that help?

Ms. PRESTON. Can I take the Fifth on that?

Senator SMITH. I think Senator Bingaman came in and saved you.

Senator Bingaman, do you have any further questions?

Senator BINGAMAN. Let me just say a couple of things.

You had said in your opening comments that you would be anxious to see if we could do a technical corrections bill on last year's streamlining act. I think that's something we ought to seriously consider, Mr. Chairman. I do not know what the procedure would be or what Senator Thurmond's thoughts would be on that, but if there was something that you folks had in the way of technical corrections that we ought to try to move quickly with, I think that would be something we ought to do.

Senator SMITH. You have not sent those up, have you?

Ms. PRESTON. No, we have not.

Senator SMITH. Send them up.

Senator BINGAMAN. Obviously, if our staff went over that with you and felt those were all things that people would support and help us carry out the intent that Congress had in this thing, I think it would be a good thing to get it done.

Also, I think a lot of these other areas, I did want to ask, unless Senator Smith or Senator Levin asked about post employment restrictions——

Ms. PRESTON. Senator Levin asked, but I would be happy to answer any questions you have.

Senator BINGAMAN. I just wanted to know the extent to which you think we ought to get into that area again, the extent to which you think it is a priority for us to try to legislate some reform in that area.

Ms. PRESTON. In the post-employment arena, we are proposing, as part of our authorization bill package which has not been approved by OMB yet, that we repeal the DOD-unique provisions. To us it seems inherently unfair that a group of people in one agency are singled out, not only procurement people but only procurement people in one department are singled out for special, very restrictive revolving door provisions. It is very tough to justify to the work force, as I go out and talk with people, why there should be unique rules that apply to DOD personnel that do not apply to a colleague of theirs doing the exact same thing in a civilian agency.

So there is a lot of consternation in that regard. A lot of people find these provisions offensive by their very nature, because it calls into question their integrity as a government employee. Basically the only reason you would institute these revolving door measures is based on a perception that people would have been influenced in making decisions as a government employee by the hope that some contractor they were working with would give them a job when they left, because once there is any discussion about a job, they have to recuse themselves anyway.

So the only thing that we are talking about here is the perception that someone who leaves the government and goes to work for a contractor that they perhaps oversaw, on a contract that they oversaw with that contractor, et cetera, was influenced by the hope that they might be able to get a job with that company if they were favorable in their decisionmaking during their time as a government employee.

Senator BINGAMAN. When will we know whether OMB approves your recommendations?

Ms. PRESTON. We hope to get something up within the next 2 weeks.

Senator BINGAMAN. Okay. I think we will be anxious to see that.

Thank you very much, Mr. Chairman.

Senator SMITH. We need to move on to the next panel, but I just wanted to follow up on one point you made in your opening statement about a pilot program, wanting another pilot program. Have you really had a chance to evaluate the ones that you have now? Have you had a chance to get enough feedback to know that you need another one? That is not a hostile question. It is just in terms of, would you want us to authorize more?

Ms. PRESTON. We know we have been able to get commercial suppliers involved in the process.

As you are probably aware, Senator, we did not get that authority on some of these programs until they were long beyond the point where we could really affect the programs, and that is one of the reasons that we are trying to do another one now, is that in at least two of the programs, because the law was not enacted until late last year, those programs had already gone through most of the source selection process, so there was not an opportunity to do the fundamental change that we would like to have seen.

So we are asking for one more program to see that and be able to prove out those concepts, and I think we have enough information right now. We cannot tell you specifically how much money we are saving or anything else at this point, but we can tell you that they seem to be working well, and if I could, I would just like to respond to your statement earlier about the fact that the system seems to be working well.

The reason I brought that up is that if you were to look behind the process I think you would find that during Desert Storm, for example, and in many other instances, people have taken extraordinary risks, personal risks, to make the process work.

In some cases, people who have done that have been severely penalized within the acquisition work force. That casts a pale on everyone else and what they are willing to do and not do in terms of making the best judgments for the government, so I would just ask you to keep that in mind, that people have, in fact, made the process work, but they do it at considerable expense, both in terms of risk to themselves and in expense of time and effort trying to figure out how to get around the rules and regulations.

Senator SMITH. I agree with that. The purpose of the remark was to really point that out, not to disagree with it.

Thank you.

Ms. PRESTON. Well, thank you very much.

Senator SMITH. Thank you very much.

Mr. Robert Murphy, the General Counsel of the GAO, and Mr. Peter DeMayo, the vice president for contract policy of Lockheed Martin Corporation. Welcome to both of you. We would appreciate it if you could briefly summarize your statement. As you know, your statements will be part of the written record, and we could take a few minutes for questions with Senator Bingaman and myself. Mr. Murphy, we will begin with you.

STATEMENT OF ROBERT MURPHY, GENERAL COUNSEL, GENERAL ACCOUNTING OFFICE

Mr. MURPHY. Thank you, Mr. Chairman, Senator Bingaman. I will be very brief and ask that my written statement be included in the record. I am pleased to be here to discuss a subject that is always timely and pressing, procurement reform.

As you pointed out, it was barely over 6 months ago that Congress passed the Federal Acquisition Streamlining Act, but it is clear that this is an area that holds a potential for a lot of dollar savings. We talk about a $200 billion annual procurement budget, but that does not include the costs to the government from its own personnel, its own equipment, its own space, to run the procurement system.

So this year we have proposals from industry groups. We have the administration bill which we have been discussing so far, which Senator Glenn has introduced. Last week Senator Roth, as you mentioned, Mr. Chairman, introduced a bill. While I have not reviewed Senator Roth's bill, from his statement it is clear that that bill is directed to a lot of the key issues that hold some fruitful promise in procurement reform, particularly an effort to try to change the culture of the procurement workforce.

I will limit my discussion to a few of the provisions of the administration bill, and I think I am going to talk primarily about bid protests, because that is both an interest of the subcommittee, and because Ms. Preston spent some time on it, and it is a subject that we at GAO know a good deal about, since we have operated a bid protest system since 1926.

Over the past 50 years, as procurement statutes and regulations and guidelines have proliferated, there has been an increasing expectation on the part of contractors that those rules and those guidelines will be enforced. Rather than guides to help the government get the best deal for the taxpayer's money, those rules have become rights, and contractors have begun to use the tools of litigation to ensure that they are enforced.

Now, that process comes at a real cost to both the government and the private sector. Just the cost of management time and attention by companies that are involved in the process can be enormous. One of the real costs to the Federal Government is the delay, as Ms. Preston pointed out, in getting goods and services.

On the other hand, the bid protest process does serve as an opportunity for oversight of Federal agencies' use of the process. We find abuses. We at GAO sustain protests every year, finding things that I think would surprise you and, as a Federal civil servant, sometimes embarrass me, but we are constantly trying to balance the costs of the system and the cost of the process against the benefits that come from having a fair and open inquiry into how agencies have done their jobs. We believe that the provisions of the administration bill also seek to establish and preserve a reasonable balance.

First, many protests are filed just to learn why proposals were unsuccessful. One of the things proposed in the administration bill is to expand the FASA debriefing process to include preaward decisions.

A lot of companies are thrown out long before the award decision is made, when the agency decides it is only going to conduct discussions with a few companies. By allowing companies to get a debriefing at that stage, they have an opportunity to find out what was wrong with their proposal, and I think we stand a good opportunity for reducing the number of protests so that companies will not be filing protests just to get hold of the agency record.

Second, we believe that administrative and judicial forums that hear bid protests would benefit from a single statutory standard of review by which all protest cases would be decided. That would bring needed clarity and consistency in decisionmaking, and hopefully would put an end to the constant debate over which forum offers either the government or vendors the best result. The draft administration bill takes this approach.

Also, the administration's proposal to establish a single judicial forum in the Court of Claims would build a body of expertise and precedent, and I ought to note that it was the recommendation of the Section 800 panel to centralize judicial consideration of bid protests in the Court of Federal Claims.

Third, the administration's proposal to revise the cost principles so that the costs of pursuing protests are not reimbursed under cost reimbursable contracts is a good one. If you are successful in pursuing a bid protest at the GAO or at the General Services Board of Contract Appeals, you can get your costs of pursuing that protest. We award those costs, as does the GSBCA, but because the costs of pursuing a protest are also allowable costs under government cost contracts, if you lose a protest in front of GAO or in front of the GSBCA, you can also get some of your costs recovered by putting them in your overhead. The administration proposes to eliminate that, and we know no reason why that is not a sound idea.

There are a number of other sound ideas that Ms. Preston discussed in terms of bid protests, many of which we support and make a lot of sense, but in the interests of speeding along, I will conclude my remarks and I will be happy to take questions at any time.

[The prepared statement of Mr. Murphy follows:]

Prepared Statement by Robert P. Murphy, General Counsel, General Accounting Office

Chairman Smith, Senator Bingaman, and members of the subcommittee:

I am pleased to be here today to discuss a subject that is always timely and pressing: reform of the Government's acquisition system.

Each year, our Government spends about $200 billion on goods and services, ranging from weapons systems to computer systems to everyday commodities. In December of 1994, a report prepared for the Secretary of Defense found that, on average, the Government pays an additional 18 percent on what it buys solely because of the requirements it imposes on its contractors. That confirmed the average estimate by major contractors surveyed by GAO that the additional costs incurred in selling to the Government are about 19 percent. While some of the Government's unique requirements certainly are needed, we clearly are paying an enormous premium for them—billions of dollars annually.

And that is only part of the Government's inflated cost of doing business, for it includes only what is paid to contractors, not the cost of the Government's own administrative system. The Government's contracting officials are confronted with numerous mandates of their own, often amounting to step-by-step prescriptions that increase staff and equipment needs, and leave little room for the exercise of business judgment, initiative, and creativity. Too often, the burden of the "how to" imposed on the people charged with fulfilling the Government's needs impedes their ability to do the job effectively and efficiently.

The requirements on the Government's sellers and buyers are well-intentioned. They generally reflect an almost constant effort to correct wrongs or add particular initiatives. It is inevitable that after a while, often uncoordinated incremental efforts can tilt the system out of balance, until the costs of requirements outweigh benefits. That is where we are today: the acquisition system is an unbalanced mosaic of requirements that lead, simply, to too much money for too little product. It is particularly important in these times of declining budgets to continue the process of bringing the system into balance.

The last Congress took a significant step in that direction with the Federal Acquisition Streamlining Act of 1994 (FASA). The Act established a simplified acquisition threshold and a preference for commercial items, as well as addressing a wide spectrum of issues regarding the administrative burden—on all sides—associated with the Government's specialized requirements. These ranged from socio-economic laws to the Government's oversight tools, which over the years have resulted in major differences between the Government and commercial marketplaces.

As required by FASA, we have been reviewing the regulatory implementation of the Act. Even before the Act was signed, the administration assembled interagency drafting teams, which to date have nearly completed the task of issuing proposed regulations for public comment. The teams will be reviewing all the comments over the next few months, and final regulations then will be issued. In addition, the Department of Defense has established teams internally to draft regulations, policy memoranda, and other changes needed to implement Defense-unique FASA provisions. We will be reporting the results of our assessment of this process later this year.

In addition to implementing FASA, the Department of Defense has a number of other initiatives underway to improve the acquisition process. Five process action teams have reviewed areas such as specifications, contract administration, and program oversight. Also, we are planning a series of reviews of the changes needed in the Department's major systems acquisitions. We will focus on identifying and evaluating the application of commercial "best practices" in areas such as manufacturing, quality assurance, and cost and schedule management. We plan to brief Subcommittee staff on the scope of our work later this month.

As important as the FASA effort was, most of those involved believe that it represented a continuation rather than a culmination of reform. There are currently a number of additional reform proposals under discussion, including an administration bill and suggestions from industry groups. We also understand that the Department of Defense will be seeking additional changes in connection with this year's authorization bill. Many, if not most, of these proposals represent a common theme: to allow industry to offer, and empower our acquisition professionals to acquire, maximum value for the taxpayer.

The proposals under discussion basically involve three issues: (1) how to simplify the process further, (2) how to select the best contractor, and (3) how to resolve disputes over the selection process. We have organized our testimony around these issues. It Is important to emphasize that although we have conducted audits and evaluations addressing virtually every phase of the acquisition process, and review almost 3,000 bid protests yearly, we have not had the opportunity to study the proposals in depth, and we may not have data useful in evaluating them. What we express today is our preliminary analysis of some of the proposals that we believe merit further consideration and study.

SIMPLIFYING THE PROCESS

Commercial Items

FASA established a preference for the acquisition of commercial items and provided for an expanded exemption for such items from the requirement for certified cost or pricing data contained in the Truth in Negotiations Act (TINA). To finish the initiative, serious consideration ought to be given to exempting all commercial items as defined in FASA from the certified data and audit requirements of TINA and from the corresponding requirements of the cost accounting standards. There are arguments that market forces may not have sufficient impact on some items contained within the FASA definition—those items not yet in the commercial market, but that evolve out of existing commercial items—to ensure fair and reasonable prices without the assistance of certified data. The question for the Congress is whether the impact of the free market on the basic item will be sufficient. Clearly, the more the Government is willing to bear the same risks as any other large customer, the more advantage it can take of the commercial market.

Simplified Acquisition Threshold

The concept of a simplified acquisition threshold set forth in title IV of FASA, under which streamlined procedures are to be used and Government-specific requirements are to be waived, is a positive one, and could even be expanded. Raising the simplified acquisition threshold from $100,000 set forth in FASA to $200,000 would result in simplifying an additional 11,000 procurements worth over $1.5 billion, based on fiscal year 1994 data. The micro-purchase threshold ($2,500) also could be raised. Under FASA, such micro-purchases are exempt from the small business reservation applicable to all other SAT purchases and are configured so as to enable non-procurement professionals to make them. This would result in considerably simplifying significant numbers of low-dollar value procurements.

FACNET

FASA established the Federal Acquisition Computer Network, or FACNET, a Government-wide electronic commerce architecture whereby firms will receive notice of Government acquisitions by computer and be able to submit offers in response electronically. The implementation of FACNET will transform the current cumbersome, paper-driven process into a modern, computer-based system readily accessible to Government and private sector users. This should significantly reduce staff time for all parties using the system and result in substantial savings.

We have been reviewing the administration's implementation of FACNET for a number of months now, and it is apparent to us that the administration is committed to bringing FACNET fully on-line just as soon as it is practical to do so. The challenge of doing that is, however, considerable. Among the difficult issues that must be addressed, we have been focusing much of our attention on the need to assure adequate security. Other issues relate to the registration of vendors, developing standards, creating a single face to industry, and of course, the adequacy of resources devoted to the effort.

Ensuring early implementation of FACNET will require sustained commitment of senior management, as well as continued oversight by the Congress. The administration should be encouraged to pursue vigorously the development and implementation of full FACNET capability on the schedule set forth in FASA.

We recommend that the Congress consider cutting the link currently in FASA between the implementation of FACNET and the use of the simplified acquisition procedures up to the full dollar limit of the SAT. Under FASA, the simplified procedures can only be used for acquisitions up to $50,000 until FACNET is implemented, at which time the simplified procedures can be used for acquisitions up to the full $100,000. Those procedures will remain in effect at the $100,000 level for 5 years. Then, unless the agency successfully implements a more advanced form of FACNET, the threshold for the simplified procedures reverts to $50,000. While this linkage was intended to encourage the early implementation of electronic coerce through FACNET, we believe that both the simplified procedures under the SAT and the use of electronic commerce are independently meritorious. As each benefits the Government and contractors, each should be implemented as soon as possible. If the Congress concludes that both will be pursued by the executive branch without one being tied to the other, then the current link could reasonably be ended.

FASA made great strides in establishing the framework for testing innovative concepts through pilot programs to be conducted by the Administrator for Federal Procurement Policy. However, the requirement in FASA that the exercise of this authority be delayed until the agency proposing to conduct the test has implemented full electronic commerce—full FACNET—impedes improvements in the acquisition process. As stated earlier, FACNET is an important program that has great merit on its own, and it should be implemented as soon as possible. Testing innovations is also important and could be pursued independently.

For example, the administration has discussed with us its interest in a test of a more limited form of competition than the current standard of "full and open" competition to be used in the acquisition of a continuing requirement where there is a successful incumbent. Another suggestion would entail the use of evaluation criteria providing for an advantage to satisfactorily performing incumbents in order to recognize the importance of longer-term supplier relationships with firms that provide the Government with value for its expenditures. Similarly, a disadvantage could be assessed against a poorly performing incumbent that is not actually defaulting on its contract obligations. These concepts could show promise in addressing the dilemma faced by agencies that would benefit from longer-term relationships with high quality, high value contractors, but may be hampered from doing so under current rule. With the current link with FACNET, the administration cannot even experiment with these ideas.

Domestic Source Restrictions

In order to better integrate the commercial and Government markets the Congress could consider easing the Government-unique domestic source restriction in the Buy American Act by replacing the 50-percent domestic component test with the "substantial transformation" test found in the Trade Agreements Act. In order to establish that an item is domestic under the Buy American Act, as it currently is implemented, a firm must be able to show that its domestically produced item is made from domestic components that comprise over 50 percent of the total cost of all components, which is a difficult task in today's global market. Under the Trade Agreements Act test, the company need only be able to establish that the item was "substantially transformed" from its components into its current form domestically.

We also believe that the current domestic restrictions scattered throughout the U.S. Code, as well as in various authorization and appropriations acts, should be revisited to ensure that they reflect today's markets and today's defense needs. Further consideration should be given to creating a comprehensive consolidated statutory provision containing those restrictions considered essential.

SELECTING THE BEST CONTRACTOR

Competitive Range

A critical objective as we move on the path toward a more commercial-type acquisition system is the removal of non-value added restrictions on the Government's acquisition workforce. The Government can best use the open market similar to commercial customers if its buyers are empowered to make decisions based upon the particular circumstances presented by each individual acquisition.

One example of a restriction we see frequently in deciding bid protests is the requirement for discussions with all firms in the "competitive range," which has long been held to mean that agencies must conduct discussions with all competing firms that may have a chance of receiving award. A review we made of information technology purchases showed that agencies include 60 to 90 percent of all firms that compete. Also, almost always the award ultimately goes to one of the top three firms submitting initial proposals. The conduct of negotiations with and the evaluation of best and final proposals from all these firms represents an enormous expense on the part of both industry and Government. This cost would be greatly reduced if contracting officers could, based on their assessment of the market conditions and the needs of the agency, limit the competitive range in a particular acquisition to no more than the three top-rated firms.

Small Business

Another area that could prove fruitful for congressional consideration concerns the current rules regarding the participation of small business firms in the acquisition process. First, the Small Business Administration's (SBA) (8(a)) program under which the SBA enters into contracts with small and disadvantaged businesses for work to be performed for other Federal agencies, could be streamlined. Agencies that actually are receiving the performance should make the awards themselves without the need, in every instance, for the SBA to participate in the contracting process.

Similarly, SBA's Certificate of Competency (COC) authority, under which the SBA determines the responsibility of a small business, could be amended to exclude negotiated procurements in which the contracting officer evaluates a firm's past performance as a part of the technical evaluation. Since FASA requires an assessment of each competing firm's past performance during the selection process, the SBA's role in determining this element of responsibility as a part of its COC authority conflicts with the responsibility of contracting officers to make the judgments needed to select the best contractor. If the Congress concludes that SBA's reviews of these evaluations of past performance are no longer necessary, reform would simplify the process.

PROTESTS

An area where further streamlining and reform might reduce the costs of the acquisition process is one with which we at GAO are particularly well acquainted, bid protests. Most will agree that there is a role for a meaningful protest process in order to ensure the perception of fairness of our public acquisition system. We believe that protests provide a relatively inexpensive check against unlawful or arbitrary decisionmaking, and we work hard to avoid needless second-guessing of the discretionary business judgments made by our procurement professionals. The protest process should carefully balance the costs of oversight against the benefits to Government contractors, the Government itself, and ultimately, the taxpayers.

Over the past several decades, contractors have come to expect greater levels of protective process in the protest system. Obvious evidence of this expectation is the existence of four places outside of the agency to protest an acquisition: GAO, the General Services Board of Contract Appeals (GSBCA), the Court of Federal Claims, or a Federal district court. These various forums offer an array of procedures and jurisdictional differences. For example, the GSBCA may only hear protests related to certain acquisitions of information technology, whereas the Court of Federal Claims covers acquisitions of all types of goods and services, but only if the acquisition happens to be in a pre-award status.

We recently issued a report that examined one measure of the impact of this system on a particularly troubled sector of the acquisition system, information technology. We found that there were significant delays in protested information technology acquisitions of all sizes. Almost half (44 percent) of all large dollar—$25 million and above—information technology acquisitions were protested. Those acquisitions took, on average, 222 days longer (41 percent) than comparable acquisitions that were not protested. Small acquisitions up to $250,000 took 50 days, or 31 percent, longer. While the exact cause of the delays is not clear from the data we collected, it is hard not to conclude that significant delay and bid protests go hand-in-hand. With delay come increased costs.

The solution has been elusive. Some have suggested the creation of a single all-inclusive protest forum. Others have suggested eliminating all forums outside of the contracting agency. Still others have argued for combining the two judicial forums and the two administrative forums, so that there would be one judicial forum and one administrative forum. All of these ideas have their merits and drawbacks as well as their adherents and detractors. I will limit myself to some of the concepts in the administration's bill, since we believe they are directed toward a better balance between the need to ensure the fundamental fairness of the system and the need to acquire the goods and services in a reasonably efficient manner.

First, the administration has a suggestion that should help reduce protests no matter what changes are made to the protest resolution system. This is a proposal to expand the new FASA debriefing process to include, where appropriate, preaward debriefings for those that have been excluded from the competitive range. This would help eliminate preaward protests that often are filed by offerors primarily because they have been given little or no information as to why their proposals were rejected.

Second, we believe the administrative and judicial forums that hear bid protests would benefit by a single statutory standard of review by which all protest cases would be decided. That would bring needed clarity and consistency in decisionmaking and hopefully would put an end to the constant debate over which forum offers either the Government or vendors the best result. The administration bill takes this approach. The administration's proposal to establish a single judicial forum in the Court of Federal Claims would build a body of expertise and precedent, although contractors in some areas of the country might prefer access to their local Federal district court.

Third, the administration's proposal to revise the cost principles so that the costs of pursuing protests are not reimbursed under cost contracts is a good one. The Government currently reimburses successful protesters at GAO and the GSBCA for those costs. Under the cost principles, however, all protesters, successful or not, may have at least a portion of their protest costs reimbursed through cost contracts. We think the payment of protest costs to successful protesters provides sufficient motivation for firms to bring alleged irregularities to the attention of the forums. We see no reason to reimburse firms for bringing unsuccessful protests.

Fourth, while it is important to pursue further reform of the formal protest forums, we have always supported fast and effective agency-level protest procedures. There is great potential here for significant savings of both time and scarce financial resources.

Finally, it may be appropriate to complement the use of simplified procedures under the SAT and the use of FACNET by testing an exemption from the formal protest process of FACNET acquisitions conducted pursuant to those procedures. Our experience is that there have been relatively few successful protests filed in procurements under the pre-FASA small purchase procedures (limited to purchases of $25,000 or less). We, of course, have no protest experience with acquisitions conducted through FACNET. A pilot program limiting protests of SAT acquisitions conducted by FACNET to those filed with the contracting agencies might facilitate a streamlined, commercial-like process for the Government's most routine acquisitions. After 3 or 4 years of experience we could conduct an assessment of whether, absent the possibility of bid protests, agencies complied with the applicable procurement statutes and regulations. We recognize that the Administration favors the outright elimination of protests other than those to the agency for such acquisitions. In view of the unknown consequences of these new procedures we believe that a test would be prudent.

Mr. Chairman, this concludes my prepared statement. I would be pleased to address any questions you or the members may have.

Senator SMITH. Thank you very much, Mr. Murphy. Mr. DeMayo.

STATEMENT OF PETER DeMAYO, CORPORATE VICE PRESIDENT FOR CONTRACT POLICY, LOCKHEED-MARTIN CORPORATION

Mr. DEMAYO. Mr. Chairman, Senator Bingaman, Senator Glenn, it is a pleasure for me to respond to your request to testify. I will keep my remarks short. I appreciate having my statement in the record.

Today, I represent the Acquisition Reform Working Group, which consists of nine associations who represent literally thousands of companies and individuals that comprise a cross-section of the entire defense and commercial-industrial base of both large and small business.

Lockheed-Martin remains committed to the ARWG because it is a very effective way to provide broad consensus positions on acquisition reform issues to both the Congress and the executive branch.

This subcommittee is to be complimented for considering additional legislation so soon after the passage of the Federal Acquisition Streamlining Act of 1994. The ARWG believes additional legislation is necessary if we are to continue the journey started with the Section 800 panel toward meaningful acquisition reform.

I will talk to the specifics of the ARWG recommended legislative package in a few minutes.

Now, FASA was the most comprehensive government-wide acquisition reform effort in over a decade. It clearly sent government procurement in a new and, we believe, more efficient direction. Its principal objective was to eliminate from government acquisition systems select, unique, and costly non-valuated requirements so as to strike a balance between the efficiency and economy of the commercial marketplace and the special care that must be exercised in the expenditure of public funds.

It opened the door to numerous opportunities, foremost of which was enhancing the potential of the government to tap into the technology and efficiency of the commercial marketplace. It permitted the executive branch to free itself of some of the statutory imposed impediments to simplification and streamlining. It also encouraged the bureaucracy to deal with many self-imposed regulatory impediments that had grown topsy-turvy over the years, and it created the opportunity to make small dollar purchases in a more efficient manner, with heavy reliance on automation.

We strongly support efforts to reform the ADP procurement process, because that reform will directly relate to achieving efficiency in the acquisition process. The real test for the success of FASA rests in its regulatory implementation. The ARWG recommends that your committee carefully monitor the regulatory implementation process and ensure adherence to both the letter and spirit of FASA.

The CODSIA, which is a multi-association group, has expressed great concern over the implementing regulations published to date. The ARWG has also provided to this committee through CODSIA its detailed comments on the implementing regulations that have been published, and in general feel they fall far short of the congressional intent to streamline the process.

However, the ARWG remains cautiously optimistic, and will continue to work with the DOD with the objective of seeking the full benefits of FASA being achieved, and will continue to keep you informed of our views on implementation.

At the same time the ARWG applauds the leadership role of Secretary Perry in making acquisition reform a priority item in the Department of Defense. It also applauds the policy decision of the Secretary to reduce, in some cases eliminate the use of military specifications and standards and move more toward commercial specifications.

We also fully endorse and support the efforts of the Secretary to bring about cultural reform within the Pentagon bureaucracy, and that is a major challenge that the Secretary has taken on.

I would now like to turn to future legislation and discuss the ARWG recommendations for legislation, which have been provided to your committee. The ARWG has identified several interrelated key issues deserving of further action by the Congress in pursuit of acquisition reform, and grouped into four broad categories, these are: additional streamlining and simplification measures, global and international measures, commercial item procurement enhancements, and small business and other issues. I would like to summarize our proposals.

In the area of streamlining and simplification, we believe that the process of contract close-out needs attention. Current statutory provisions on the obligation and expenditure of appropriated funds needlessly impair the efficient administration of ongoing contracts.

These limitations impair the ability of the Department of Defense to pay its rightful obligations in a timely and cost-effective manner, and impede the ability of the Department to meet its current military requirements by diverting current appropriations to pay old debts. As a result, contractors are not being treated fairly.

Contracts are not closed out in a timely manner, and current congressional decisions on appropriations are undermined.

This problem warrants attention now, and we hope you will give full consideration to our recommendations.

We also urge the elimination of government-unique certifications, which add to administrative costs, adversarialism, and even the unnecessary criminalization of the process. There are currently about 140 certifications required in DOD contracts. Only a select few should be imposed by contract, and then only to the extent expressly required by statute. Elimination of these certifications would not impair the ability of the government contracting officers to enforce government contractual rights or protect the government's interests.

To further our global competitiveness, the ARWG supports repeal of recoupment as now required under the Arms Export Control Act in the case of foreign military sales transactions. International sales are an essential element of industry's ability to maintain a viable industrial base. We feel that U.S. firms should not be put at a competitive disadvantage in the international marketplace.

As for commercial acquisition, action is needed in three areas. First, we see no compelling justification for the post-award audit of commercial contracts when prices have been determined in advance of contract awards to be reasonable. Post-award audits of commercial contractors are not needed or desired, and if not eliminated will certainly insure that we will not attract commercial companies to the defense marketplace.

Second, we need to fully exempt commercial products and services from coverage under the Truth in Negotiations Act, and third, we need to expand the statutory exemptions available to commercial products and services.

For instance, domestic source restrictions should not apply to commercial acquisitions. If they cannot be eliminated, at a minimum their coverage should be standardized. As an example, the substantial transformation rule of origin contained in the Trade Agreements Act should be applied uniformly both to that act and to the Buy American Act when determining the country of origin of a proposed product.

FASA made it easier for the government to buy commercial products, but additional legislation is needed to make those commercial firms, large and small, willing to enter the government marketplace and offer the government best value for its requirements.

The ARWG fully endorses efforts within the administration and the Congress to make major changes to the procurement integrity statute and eliminate the plethora of overlapping, redundant, and conflicting laws governing ethics and conflicts of interest.

This will deal with a major recommendation of the Section 800 panel. We will work closely with the Congress in seeing to the passage of this much-needed streamlining initiative.

I would also like to say a word about protests, which has been a lively topic today. More detail is in the formal statement, and the ARWG has begun a review of the administration's legislative recommendations to change the protest system.

However, we want to be clear in our view that protests are an unfortunate result of a process that is not working. It is the process that needs to be fixed, and this issue needs root cause analysis. If, through acquisition reform efforts, we can move to an efficient procurement process, then protests will not be a significant issue.

Finally, there is increasing attention being paid to private versus public sector performance of government services. We urge the Congress to make a strong and unequivocal statement of support for private sector performance of those services that are not inherently so unique as to require in-house performance.

Recently, there have been several legislative proposals for further procurement reform. They have been identified in this hearing today. We have, in the ARWG, our analysis underway and we will provide it to you as soon as possible.

Mr. Chairman, thank you for this opportunity to testify. The ARWG looks forward to continuing a constructive dialogue with your subcommittee, and you may be assured we are fully committed to a good faith effort to improve the acquisition process.

Thank you, sir.

[The prepared statement of Mr. DeMayo follows:]

PREPARED STATEMENT BY PETER DEMAYO, VICE PRESIDENT, CONTRACT POLICY, LOCKHEED MARTIN CORPORATION

Mr. Chairman and members of the subcommittee, it is a pleasure for me to respond to your request to testify before you on acquisition streamlining and simplification. I am here on behalf of the nine associations which have formed the "Acquisition Reform Working Group" (ARWG). These organizations are listed at the end of my statement.

Together, we represent tens of thousands of companies and individuals, the overwhelming majority of which are small businesses, majority and minority-owned businesses, companies which do business with the Department of Defense only, with the civilian agencies only, and with both. We also have members of all sizes who refuse to do business with any Federal agency, in part because of the very acquisition laws which are the focus of today's hearing.

We are pleased that this subcommittee is interested in the issue of additional legislative requirements for acquisition reform. Many of you were strong supporters of the need for acquisition reform in the last Congress, which culminated in the enactment of the Federal Acquisition Streamlining Act (FASA) of 1994. At that time, there was a mutual recognition that even more needed to be done.

BACKGROUND

FASA was the result of a 4-year bipartisan effort (beginning with the Section 800 panel review of Defense Department acquisition laws) to streamline and reform the existing costly and complex Federal procurement process. It represents the most comprehensive government-wide acquisition reform effort in over a decade. The principal objective of FASA is to strike a more equitable balance between the multitude of government-unique policy requirements imposed on Federal procurements and the need to lower the Federal Government's cost of doing business. The Act accomplishes this objective by making it easier for the government to acquire commercial goods and services and to use commercial practices; by streamlining the rules and regulations for high-volume, low-dollar Federal procurements; and by improving small business access to government contracting opportunities. The Act also created, in most cases, a uniform government-wide acquisition policy in these areas.

The government spends approximately $200 billion a year on the procurement of goods and services. While the vast majority of contract actions are for smaller dollar contracts, the overwhelming percentage of the dollars are awarded in major weapons systems procurements. This volume of expenditures evokes an understandable concern about ensuring that the interests of the taxpayer are protected. This, in turn, has led to redundant controls and certifications which unnecessarily complicate the process, and significantly increase the cost of goods and services which the government buys.

The result is a system overloaded with controls to guard against "fraud, waste and abuse"—controls which shortchange the taxpayers because of the higher prices caused by non-value added costs. Both the government and the contractors' workforce are so challenged just coping with the proliferation of regulations and procedures that there is little time or incentive to be innovative or to exercise judgment and there is little or no individual accountability. Indeed, under the current system where contracting official's judgments are routinely second-guessed and challenged, it is understandable that few are willing to exercise flexibility at the risk of shortening their careers. This culture must be changed.

Two comprehensive reviews—the Acquisition Law Advisory Panel on Streamlining and Codifying Defense Acquisition Law (the so-called "Section 800 Panel") and, more recently, the National Performance Review—have documented the need to streamline procurement procedures to increase access and competition in Federal procurement, and save the government money. The studies also indicated that current trends must be reversed as the first step to instituting that cultural change in the acquisition workforce.

Both of these studies, and dozens of other recent government and private sector reviews, concluded that the Federal procurement system had evolved into a complex maze of laws and regulations that made the process too cumbersome and failed to provide sufficient incentives for suppliers to deliver quality products and services at reasonable prices, or to allow government personnel to exercise prudent discretion and good business judgment. Furthermore, the studies showed that the current system discourages companies—especially commercial companies—from wanting to do business with the government.

In the last Congress, as we jointly sought to address the barriers to a streamlined process, however, we remained cognizant of the concerns over fraud, waste and abuse that created many of these barriers in the first place. FASA properly addressed many of those barriers to a streamlined, efficient purchasing system, particularly for the smaller dollar purchases, while, at the same time, remaining sensitive to those concerns.

FEDERAL ACQUISITION STREAMLINING ACT OF 1994

With the passage of the Federal Acquisition Streamlining Act of 1994, Congress took a significant step toward reforming the way in which the government procures goods and services. The Act addresses a wide range of issues and concerns relative to the essential public-private relationship and establishes a framework for new, more productive business relationships.

In particular, improvements were made in areas related to commercial item procurements, the Truth in Negotiations Act (TINA) requirements for the collection and submission of cost and pricing data, and the creation of the simplified acquisition threshold.

- **Commercial Items.** Facilitating the procurement of commercial products and services is perhaps the single most important issue to be addressed in acquisition reform. It was a major focus by everyone.

FASA is based on the premise that the forces of the commercial marketplace can be relied upon by the government as they are by all of us when we spend our own money—to ensure that products meet our requirements and that the prices and terms are fair and reasonable. The Act establishes a specific preference for procurements of commercial items. It also exempts such procurements from a number of statutory requirements, including several that currently are "flowed-down" to subcontractors.

- **Truth in Negotiations Act (TINA).** Past TINA requirements resulted in some of the most onerous burdens on industry due to the amount of information that a contractor is required to collect uniquely for the government.

FASA permanently increases the threshold for the mandatory submission of certified cost or pricing data, government-wide, to $500,000 (adjusted for inflation). It also creates an explicit exception for certain commercial item procurements.

- **Simplified Acquisition Threshold (SAT).** FASA establishes the SAT threshold at $100,000 for an agency's use of simplified contracting procedures. Such procurements would be exempt from a number of statutory requirements. This simplified process is also explicitly available to prime contractors for their subcontract purchases under $100,000.

IMPLEMENTATION

Even with the enactment of FASA last year, all parties agreed that the real test would be in the implementing regulations. ARWG recommends that the Senate Armed Services Committee and other congressional committees continue in taking an active role in the oversight of the executive's implementation process. Acquisition reform is at a very critical point, and we certainly hope your committee will continue carefully monitoring the regulatory process and ensure adherence to both the letter and spirit of the Act. Otherwise, many gains that FASA represents could be lost.

The Council of Defense and Space Industry Associations (CODSIA) has expressed great concern with many of the regulations published to date. We have provided the committee with our detailed comments on the implementing regulations that have been published. ARWG, too, believes that many of the implementing regulations fall short of the congressional intent to streamline the process. Indeed, as we move through the implementation phase, we believe it is necessary to consider legislation to clarify congressional resolve in a number of areas. Our additional proposals in these areas will be developed once the administration concludes its rulemaking efforts in June.

FUTURE LEGISLATION

ARWG Key Issues

Continuing the push for acquisition reform remains an issue of central importance to the Congress' goal of achieving a more efficient government and getting more from the budget dollars. It is of central importance to industry also. The degree to which the government is able to acquire better quality and less costly sources of goods and services (e.g. by removing costly non-value added requirements) clearly will be a benefit to the American taxpayer and a step toward greater efficiencies in the government buying process.

To that end, the Acquisition Reform Working Group firmly believes that further legislation is necessary to fully effect the fundamental reforms needed to ensure the efficient and effective conduct of Federal Government contracting. ARWG recommends that four broad categories of issues be addressed in the 104th Congress.

(1) Additional streamlining and simplification measures. These include:

- certification elimination
- elimination of unauthorized clauses
- contract close-out streamlining
- simplified solicitation

Each of these issues applies across the entire range of government procurement actions. The added cost on each individual contract in terms of extra paperwork, cost-of-money and inefficiency totals up annually to many millions of dollars in taxpayer money.

For example, legislative action is needed to ensure sufficient funds to streamline contract close-out without having to shift funds from current programs and also to prohibit non-value added paperwork and oversight steps. When a contractor completes performance on a contract for the government, the final payments due the contractor are withheld by the government until the government can audit the contractor's billings and negotiate final payment rates. Typically, this process takes 4 or 5 years and, very often, as many as 7 or 8 years. One member company waited 12 years for its final payment—not because there was any dispute over the funds; but because the government just didn't get around to completing the audit.

Such inaction would never occur in the private sector and should not be allowed in the public sector. Last year, the House did include language in its version of FASA to deal with this problem. That language was, however, dropped in conference. This year, ARWG has a proposal that would require the timely negotiation of provisional payments as soon as performance under a contract is complete. The proposal would also place under the Prompt Payment Act those payments due the contractor after all final negotiations and audits are complete. The proposal also addresses the availability of funds to make these overdue payments.

Legislative action is also needed to eliminate statutory and regulatory contractor/offeror certification requirements, most of which are unnecessary to ensure that the government receives the best value. Certifications generally are a way of providing the government with a "comfort factor," or a double-check on information that is otherwise available, but they subject contractors to severe administrative and even criminal penalties for inadvertent misstatements.

(2) Global and international related measures.

In this area, for example, is the elimination of the statutory vestiges of recoupment of non-recurring cost. In the highly competitive global marketplace, recoupment often can mean a 20–30 percent competitive disadvantage to U.S. companies. With such a disadvantage, U.S. companies can lose sales opportunities which results in a loss of U.S. jobs, less U.S. defense capability and, with reduced volume due to the loss of sales, a higher cost to U.S. taxpayers for defense products. The administration supports this repeal proposal.

(3) Additional commercial items procurement measures.

The Congress enacted many significant commercial product reforms in FASA. A few important issues, however, remain—issues that, despite last year's reforms, may continue to keep commercial companies from selling to the government. There are at least two additional areas we believe should be addressed in the next installment of acquisition reform measures:

- A comprehensive list of statutory exemptions for commercial prime contracts, including a clear and unambiguous TINA exception.

The benefits gained by purchasing a commercial product are greatly reduced with the introduction of even a few government-unique terms and conditions. A commercial item purchased by the government should not, as a practical matter, be treated differently than items sold to commercial customers.

Therefore, to accommodate the government-unique terms and conditions, new systems must be established by commercial suppliers, particularly small business, causing increases in costs and delayed schedules—and the company becomes less competitive as a result, assuming the company wants to pursue the government marketplace. We have almost a decade of experience that piecemeal commercial products reform simply will not attract new entrants or reap the cost savings and efficiencies the government needs in this critical budget environment. Statutes of greatest importance to commercial industry that were not clearly exempted last year include those relating to Rights in Technical Data, the Truth in Negotiations Act, and post-award audits.

We believe that no government-unique terms and conditions should apply to purchases of commercial products. When the government acts as a player in a larger commercial marketplace, it enjoys the same protection as other buyers and needs no unique protection. Competition ensures that the prices and terms are fair and reasonable, and that product quality meets contract requirements.

Also, ARWG would like to emphasize the need for statutory relief rather than simple waiver authority for the executive branch. We have found that where waiver authority has been available to the Defense Department, for example, the Department has been reluctant to use it, particularly when the procuring activity is required to elevate approval to the agency head or above. It can take years to secure waiver authority.

As mentioned above, industry recommends a clear, unambiguous TINA exemption. We must, however, recognize that the regulators are hamstrung by the legislative construction. A large part of the problem lies in the fact that FASA created a "new exception" for commercial items at Section 1204 and Section 1251 and a "catalog and market price" exception for commercial items already existing in TINA. Industry has found that the proposed regulations create different treatment for qualifying commercial items depending on the exception.

- Elimination of post-award audits for commercial product procurements. FASA, on commercial contracts, grants post award audits for 2 years after award of a commercial contract. We believe that a competitive price for a commercial item can be established by market research techniques, surveys and the like. When this information is not available, the vendor can support the price of the commercial item through other objective evidence, such as customer orders and invoices and purchasing agreements with other customers. We believe the government, therefore, can adequately audit price reasonableness information prior to reaching an agreement on the price of a commercial product. We want to make clear, however, that if a company commits fraud, the government should, and will, have full rights to impose the penalties under current commercial law. Fraud is not tolerated in any marketplace.

(4) Small business and other items.

ARWG supports programs that encourage and assist small businesses (including small disadvantaged and women-owned businesses) to obtain a "fair share" of Federal procurement opportunities. FASA included many significant benefits and protections for small businesses in Federal contracting. ARWG believes that more can be done to facilitate small business participation. Among our suggestions are making permanent the Defense Department's pilot mentor protege program and extending needed authorities to all government agencies; expanding the Defense Department's comprehensive subcontracting test program and providing clearer authority to civilian agencies for their own subcontracting programs.

Additionally, there are several other major issues that should be addressed.

Private Sector Performance of Government Services

It is time for the Congress to make a strong and unequivocal statement of support for private sector performance of government services. Driven by severe budgetary pressures, cities, counties and States across the Nation are rapidly turning to the private sector to provide services of every conceivable kind, recognizing as they do that the outsourcing of government services saves money and often improves the quality of services.

These governments have also recognized that there are scores of functions performed by government personnel that government simply doesn't need to perform and that the private sector could provide. And since we know that growing jobs in the private sector is the key to our Nation's economic well being, it only follows that a course of aggressive outsourcing serves the interests of the government and its citizen taxpayers.

We understand that the administration may recommend in its fiscal year 1996 DOD authorization package a number of initiatives designed to achieve that goal at DOD. We hope that this committee will review and support those recommendations which will genuinely enhance outsourcing at DOD and take additional steps that will bring us closer to realizing the goal of outsourcing most of DOD's non-core workload.

For instance, the requirement that decisions to contract existing functions be supported by extensive public/private cost comparisons is simply not yielding the kind of data necessary for truly informed decisionmaking. Simply, the systems that would enable a truly accurate accounting of government's full costs, including all overhead, capital, direct and indirect costs of the type contractors must account for, does not exist in the government. We question the wisdom of requiring costly and time consuming comparative study processes in advance of awarding a contract for an existing function.

If these requirements for cost comparisons are not repealed we strongly recommend that Congress authorize the creation of an independent, high level panel, perhaps based at a major American graduate school of business, to study the cost comparison process as it now exists, particularly under OMB Circular A–76, and make recommendations as to how that process can be made more effective. Our goal is to develop a methodology for costs comparisons which is simpler, more streamlined and less costly, but which also includes a set of factors that can be used to account for elements of cost which existing systems do not include. If we are going to utilize cost comparisons, then we must ensure that they are fair and accurate and that their execution is not overly time consuming and costly.

Procurement Integrity

The Section 800 Panel on Acquisition Laws reviewed existing statutes governing ethics, the exchange of information and conflicts of interest in defense acquisition. The Panel recommended the repeal of most of the Procurement Integrity law (41 U.S.C. 423), but suggested that a provision on the protection of procurement information and source selection information be enacted as a stand-alone "information-protection" provision.

The Federal Acquisition Streamlining Act of 1994 (FASA) took the first step toward fulfilling the Section 800 recommendation by enacting minor changes to the Procurement Integrity statute. The proposed FAR implementation of these changes, which has been published for public comment, faithfully represents the intent of FASA. However, these changes did not address the heart of the Section 800 Panel's recommendation.

Much remains to be done to eliminate the plethora of overlapping, redundant and conflicting laws governing ethics and conflicts of interest. The House of Representatives, Senator Roth, and the Clinton administration have already addressed procurement integrity reform in their acquisition streamlining proposals.

The proposals made by the administration and by Chairman Clinger, Chairman Spence and Chairman Gilman are very similar to our proposal, but the latter goes a little farther toward eliminating redundant conflict of interest laws. Both proposals completely restructure the Procurement Integrity Law to make it into a statute that will protect source selection information and bid or proposal information. There are civil, criminal and administrative penalties for violations; such sanctions are included in both the House and the administration bills.

In addition, the Clinger/Spence/Gilman bill eliminates several post-employment provisions in Titles 10, 18 and 41 (10 U.S.C. 2397, 2397a, 2397b, 2397c; 18 U.S.C. 281; and 41 U.S.C. 428). Enactment of these changes will further streamline the oversight and understanding of post-employment prohibitions and limitations without relinquishing any of the protections now enjoyed by the government.

ARWG supports the initiatives introduced by Chairmen Clinger, Spence and Gilman and by the administration. Enactment of these changes will go a long way toward achieving real streamlining and needed reform in the ethics and conflict-of-interest statutes impacting the government acquisition process.

Protests

One of the areas of heightened attention is the proper role for, and access to, protests. While an important issue, to be sure, at this point we believe the issue deserves far more light and a little less heat. ARWG has begun our detailed review of the administration's legislative recommendations for changes to the protest system. We are also including recommendations made by other study commissions and our own companies' experiences. We expect our review and coordination to be completed shortly and we will certainly share those positions with the Congress and with all of the interested parties.

However, it is clear that protests are an unfortunate, but necessary part of the Federal acquisition system. In and of themselves, they serve as a valuable check on the actions of government to ensure that the system is fair, open and consistently applied to all. In our view, it is not a question of whether there needs to be a protest system in the Federal acquisition system, but rather what protest mechanisms are the most effective.

It is critical to recognize that the protest provisions of current law and regulations are only a part (and a very small part) of the entire Federal acquisition system. Rather than looking at protests as a stand-alone matter, as some have suggested, our review will be looking more deeply into the earlier-in-time requirements development and contract formation processes to identify root causes for why protests are filed. In addition, we believe it essential to further segment our review between the unique arena of information technology (IT) procurements and non-IT procurement awards, since recommendations for IT procurements may not be applicable to the non-IT procurements, and vice versa.

Many of the associations' member companies have been using a variety of alternative dispute mechanisms to resolve their concerns without having to resort to formal litigation (or formal protests). We will be exploring whether barriers exist to greater use of a wide range of these alternative techniques, and making recommendations on how they can be more readily utilized.

Armed with this information, we believe that all stakeholders in the acquisition system can then more properly determine whether and if changes are necessary and what if any specific changes can and or should be made throughout the procurement system.

Some have suggested that the Federal Government emulate commercial practices, and suggest that challenges to award decisions are anomalous in commercial practice. While partially true, however, in our view it is inappropriate to look only at the dispute area of commercial contracting and seek to draw analogies for developing solutions for government contracting. Simply, the entire solicitation and source selection processes differ significantly between government and commercial contracting—differences which we believe more properly accounts for differences in the incidents of "protests" in the commercial arena.

Finally, we will certainly explore in detail the public policy issues surrounding the administration's recommendation to preclude access to protests for awards made using "simplified acquisition" procedures or through the computer-based "FACNET" system. These two procurement methods, which could account for more that 98 percent of all Federal procurement transactions raise unique issues which merit special attention.

ARWG also believes that attention should be given to addressing the information technology acquisition process. In addition, legislation should be enacted that authorizes sales by the Defense Department of low value plant equipment to incumbent contractors.

Attached is the list of the individual items which fall into these broad categories. A copy of the complete ARWG package has been submitted to the subcommittee for inclusion in the record. Also, copies have been provided to all the offices of the subcommittee members. However, this package does not encompass all of the issues that industry is pursuing. We are seeking to refine several additional legislative initiatives. Indeed, there are several coalitions working on additional legislative proposals which ARWG Associations will support.

FEDERAL ACQUISITION IMPROVEMENT ACT OF 1995

ARWG is completing its review of the draft of the administration's proposed Federal Acquisition Improvement Act of 1995. As soon as the bill is introduced in final form and our review is completed, we will be pleased to provide the subcommittee with our detailed assessment.

FISCAL 1996 NATIONAL DEFENSE AUTHORIZATION ACT

ARWG understands that the administration intends to offer certain Title 10 related acquisition reform matters for inclusion in the Defense Authorization Act. We have discussed the outlines of these recommendations with DOD, but have not seen the final package. We will review the items and will provide the subcommittee with our comments.

DEPARTMENT OF DEFENSE ACQUISITION MANAGEMENT REFORM ACT OF 1995

This legislation introduced on March 29 by Senator William Roth, Chairman of the Senate Governmental Affairs Committee (S. 640), and subsequently by Rep. John Kasich, Chairman, House Committee on the Budget (H.R. 1368) addresses a number of acquisition policy issues of great interest to the defense industry, including depot policy matters. A separate multi-association/industry group, many of which are members of ARWG, is focusing specifically on the depot policy related items and is developing recommendations for Congress. ARWG is also reviewing the remaining acquisition provisions in the Roth-Kasich bills, and will provide our comments to you.

FEDERAL ACQUISITION REFORM ACT OF 1995

Turning to H.R. 1038, the bill recently introduced by Chairman Bill Clinger, Floyd Spence and Ben Gilman, ARWG applauds their revisions to numerous procurement integrity statutes and the repeal of recoupment provisions in the Arms Export Control Act. These items were discussed separately in other portions of this statement.

CONCLUSION

The Acquisition Reform Working Group would again like to thank the subcommittee for this opportunity to testify. We recognize that it would be easy to rest on last year's laurels—especially since this committee did yeoman's work. More, however, remains to be done in order to promote an acquisition system that can move the government and industry into the 21st century.

We appreciate the willingness of the subcommittee and committee members to reach out to us for assistance in developing acquisition streamlining measures. We look forward to continuing this dialogue.

Now is the time to enact additional acquisition reform initiatives that will bring us one step closer to the streamlining goals we all share.

ACQUISITION REFORM WORKING GROUP

Aerospace Industries Association
American Defense Preparedness Association
American Electronics Association
Contract Services Association
Electronic Industries Association
National Security Industrial Association
Professional Services Council
Shipbuilders Council of America
U.S. Chamber of Commerce

1995 ARWG AGENDA

1. Contract Close-Out Streamlining
2. Simplified Solicitation
3. Certification Elimination
4. International Competitiveness
5. Additional Commercial Item Waivers
6. Amend Post-Award Audit
7. Elimination of Non-Standard Clauses
8. Domestic Source Restrictions
9. Waiver of Ethics Provisions
10. Information Technology Review
11. Increased Small Business Opportunities
12. Sale of Government Property

Senator SMITH. Thank you very much, Mr. DeMayo.

Mr. Murphy, let me try you on the Davis-Bacon. I think I might get a different answer.

In 1979, though, your office recommended the repeal of Davis-Bacon. (1) Do you still have that position, and (2) if you do, what do you estimate, say, over the next 5 years, Davis-Bacon repeal could save the U.S. Government and the Defense Department alone?

Mr. MURPHY. Most recently, Mr. Chairman, earlier last month, GAO issued a report advising Congress of a number of options that were available to reduce the deficit, and one of the options that we presented to the Congress was the opportunity to save money by either repealing Davis-Bacon or raising the threshold.

The threshold now is $2,000. We estimated that if Davis-Bacon itself were repealed, the Federal Government could save about $400 million a year, I think $390 million of appropriated funds.

Senator SMITH. DOD or overall?

Mr. MURPHY. That is government-wide. I do not think we broke out the numbers for the Department of Defense. In fact, let me see. Yes, we estimated appropriations savings of between $390 million and $430 million a year over the next 5 years.

Senator SMITH. Is it your position it should be repealed?

Mr. MURPHY. We think that that is an option that the Congress can seriously consider, either repealing or raising the threshold. Either one would save a great deal of money.

Senator SMITH. Did you try to break it out? Say, if the threshold went to $100,000?

Mr. MURPHY. I do not know that we have done the numbers to see how much would be saved at a particular level, because until very recently there were not any concrete proposals to raise the threshold to any particular amount. I understand a bill has been reported from committee, S. 141, that proposes repeal of Davis-Bacon, and that there is a proposal to raise the threshold to $100,000, but we have not done the numbers on how much that would save the government.

Senator SMITH. Mr. DeMayo, how do you feel about that?

Mr. DEMAYO. I think the Davis-Bacon act solved a problem about 50 years ago but has probably long outlived its usefulness. I think if we want to rely on the marketplace, it is time to give it a chance to work.

Senator SMITH. Mr. Murphy, another point, and then I will yield.

In your statement, I was interested in the argument that you gave there for consideration of giving the Federal agencies the authority to limit the competitive range of firms with whom the agencies have to conduct their discussions before they award a contract.

You can see the pros of that. You can see the cons of it, too. You also have to be very careful. You have to be fair here. How would you suggest we accomplish that? Would you do it by amending the law, or would you do it by regulation changes?

Mr. MURPHY. The problem with doing it by regulation is that the statute currently contains a provision which says that contracting officers are to conduct discussions with companies in the competitive range, and that has been interpreted for decades to mean any company that has a chance of winning an award.

What contracting officers have done with that, and we see it in the context of bid protests all the time, is in order to shield themselves from bid protests and ensure that they are not going to be second-guessed, they include companies in the competitive range that one would have to wonder have any chance at all at being successful.

I could give you examples of small companies that were included in the competitive range and virtually bankrupted themselves preparing revised proposals and benchmarking products, thinking they had a realistic chance of winning when they really had no realistic chance of winning.

And so you are right, contracting officers have to use discretion. There are times when you would want to have 5 or 10 companies in the competitive range to conduct discussions, and sometimes you would only want one or two. I think that it could be done by regulation, but I think regulation would be very unlikely to have any real impact on what contracting officers do unless they knew they were insulated somehow from a protest by the tenth company that really had no chance of winning to come in and challenge the contracting officer.

So we have suggested the option of a statutory change which would clarify, we think, for contracting officers what their responsibilities would be.

Senator SMITH. I would think the problem would be a lot of companies, and you are absolutely right, many companies that do get interested in these contracts have no capability even to provide the service required or needed, but they do not know that always, and if you shut them down—there would be an opportunity, I think, for some in the government to exploit this and shut people out who might have a legitimate capability here to be involved in the bidding process. That is my concern.

Mr. MURPHY. It is a legitimate concern. I would offer two suggestions. One is that if a contracting officer decided to limit the competitive range to three or four or five companies or to two or three, companies that are excluded can still file a bid protest and argue that they really should have been one of those top three companies.

We have not suggested that companies should be at the mercy of the contracting officer's judgment in this matter. They would still have the opportunity, if they felt they were wronged, to question that.

I just offer an anecdote. I have known a number of companies which have said to me that if they had only known how far down they ranked after they submitted their initial proposals, they would not have wanted to be in the competitive range.

You see, one of the things contracting officers cannot do is tell you what your initial ranking is. They can only tell you that you are in the competitive range, and here are my concerns about your proposal. I suspect there are an awful lot of companies that would be glad to save the money and the time and the effort to compete. If they knew how far down they really ranked, they would as soon be out of the competitive range.

Senator SMITH. Thank you. Senator Bingaman.

Senator BINGAMAN. Thank you very much. Let me ask you, one of the things that you brought up in your testimony, as I understood it, you said at the present time when a bid protest is filed, the government will reimburse the protesting company for the cost of that protest. I guess that is the attorney's fees as well as any other expenses.

Mr. MURPHY. Expert witnesses.

Senator BINGAMAN. Expert witnesses, all of that, if the protesting company wins. But you are saying that the practice is that they also reimburse the company for the cost of the protest if the protesting company loses, because the company will build that into their overhead in some way.

Mr. MURPHY. Yes, sir. However, the cost regulations do not allow companies to charge to the government the costs of pursuing claims against the government. They can charge ordinary and necessary litigation that the company is involved in, but if they are filing a claim against the government, the cost regulation says we, the government, are not going to repay you those costs through your cost contracts.

Bid protests have not been traditionally considered a claim against the government. They were viewed as a company acting as a private attorney general to correct the agency for doing wrong, and so historically the costs of pursuing bid protests have been allowable costs, and companies that have cost-based contracts in which a certain portion of their overhead is repaid by the Federal Government can include in their overhead costs the costs of pursuing the bid protest.

So if they lose, they get to some extent, depending on how many cost contracts they have and what the makeup of their business is, a certain percentage of those costs repaid by the government. That is what the administration bill and now Senator Glenn's bill would prohibit.

Senator BINGAMAN. Well, Mr. Chairman, just for the record, and Senator Glenn both, I think we definitely need to fix that this year. I think it is an absurd result when the taxpayer is essentially paying for a person to protest a bid that they then lose, and we pay their expenses for filing the protest. I think that makes absolutely no sense in my view.

Senator SMITH. Especially if they were not qualified to bid in the first place.

Senator BINGAMAN. I think we clearly need to fix that.

On this computer acquisition issue that I was asking Ms. Preston about, as I understand it, GAO is the forum for bid protests in noncomputer acquisitions. Most computer acquisitions, GAO is not the appropriate forum for the bid protest. Is that an accurate assessment of things the way they now stand?

The suggestion I asked her about was whether or not GAO should be the forum for bid protests in all of these matters, including computer acquisitions, and she seemed to say yes. That was what I understood her to say. Is that your view, as well? Do you folks have the expertise and competence to do that just as well as the GSBCA?

Mr. MURPHY. GAO currently is the exclusive forum for bid protests that fall under the Warner act. DOD procurements in which the computer elements themselves are integral to a weapons system, those protests come to GAO now. Those are not within the jurisdiction of the General Services Board of Contract Appeals, and also GAO has a good many protests of computer procurements anyway. We have concurrent jurisdiction, if you will, with the GSBCA.

I must say, though, that in this day of declining budgets we at the GAO are tightening our belt as much as we possibly can and, looking forward to the size of our fiscal year 1996 appropriation, that we would certainly be a reluctant suitor. I do not think we are seeking additional jurisdiction.

I think the GSBCA does a decent job. What the administration bill is intended to do is to encourage the General Services Board of Contract Appeals to use the same standard of review that GAO uses, and the administration and Ms. Preston were of the view that if that were the case, some of the problems that they see would go away.

Senator BINGAMAN. I guess the question, obviously, is whether or not they should all use the same procedures. You have a much more informal set of procedures than this GSBCA uses, as I understand it, and that is part of the objection to the continuation of the present system.

Mr. MURPHY. We have made the judgment that some procedures are necessary to give protestors a fair opportunity to present their case.

We do allow hearings in cases where there is a dispute of fact that cannot be resolved except by having a hearing. We do provide for document discovery under protective orders so that the protestor can see what the agency record provides, but we have decided not to go to the extent of allowing depositions or interrogatories or requests for admissions or holding hearings in every case, as the GSBCA does. In our judgment, that level of process was unnecessary to provide fairness and a full opportunity to investigate the agency's actions.

Senator BINGAMAN. Mr. DeMayo, let me ask you, one of your suggestions is that we eliminate the certification requirements.

Mr. DEMAYO. Yes, sir.

Senator BINGAMAN. You were saying that some of those were required by statute. A lot of them have been required by regulation, I guess.

Mr. DEMAYO. Right.

Senator BINGAMAN. How much of the elimination of those certification requirements can be done without us legislating?

Mr. DEMAYO. The ARWG I believe has submitted a package to the head of the DAR committee suggesting that there are a number they could eliminate within the Pentagon itself by regulation, so I think they clearly could do it.

I think the main purpose we had is to bring to you that there may be some statutory certifications that could be eliminated, and just to give you a sense of the overall impact, that is in terms of the red tape and the process.

Senator BINGAMAN. Let me just do one followup, Mr. Chairman, then I will quit, but have you provided us with a list of the certification requirements you think do have value and a list of those you think do not so that we could sift through the two groups?

Mr. DEMAYO. Yes, sir. I am not sure we have given it to you yet. It is available, and we will certainly be sure that your staff has it.

Senator BINGAMAN. That would be great. Thank you.

Senator SMITH. Thank you, Senator Bingaman. Senator Glenn.

Senator GLENN. Thank you, Mr. Chairman.

First, I appreciate your courtesy in permitting me to sit in with the committee, although I am not a member. This is an issue that all of us here have done a lot of work on over the last couple of years, and our efforts culminated last year, of course, in the passage of the Federal Acquisition Streamlining Act, and now the bill that I submitted on behalf of the administration. I was glad to do that.

I have just a short statement I ask be entered in the record of the committee, if I might.

Senator SMITH. Without objection, it will be entered in the appropriate place.

Senator GLENN. Mr. Murphy, you have talked about a single standard of review, and you have endorsed the concept in the administration's bill. Could you elaborate on that a little? Do you think the standard in the administration bill is a good starting point? Where do we go from there?

Mr. MURPHY. I think so, Senator Glenn. The standard in the administration bill is, I think, a good effort to approximate the standard that is used by GAO.

There are an awful lot of words in it. I think we would certainly be happy to work with anyone to craft it a little tighter. I think we could certainly live with that standard. It is an approximation of the one we have now, with one small exception.

Let me just say that there are probably two or three cases a year which would fall outside that standard for GAO. There are companies that misrepresent the staff that they are going to offer to perform a contract. We have seen cases in which companies have represented that someone who has been dead for 8 months is going to be a program leader performing the contract. Last year, we had a situation where someone had left for England, and yet the company was suggesting they were going to have an integral role in performing the contract.

In two or three cases a year, we will allow protestors to submit extraneous evidence outside the record to show that the successful offeror really has no ability and had no intention of offering those individuals to perform the contract. Those cases, and there are not very many of them, would fall outside the standard that the administration has proposed, but with that exception, I think we are satisfied with it.

Senator GLENN. Mr. Chairman, I would note that the administration's bill does cover the prohibition of some of the expenditures for bid protests that have previously been okayed. We may want to look at that in more detail and modify it somewhat, but it is covered in the bill now.

Mr. Murphy, further, I note that the administration's bill contains several provisions designed to encourage firms to file protests with the contracting agency as opposed to an outside forum. Are you aware of any currently existing agency level procedures that have the widespread confidence of the contracting community?

Mr. MURPHY. I do know of one, Senator Glenn, and I notice that Ms. Preston in her prepared testimony talked at some length about the Army Materiel Command. The Army Materiel Command has for several years now had what looks to us to be a very successful agency level protest practice. It is accomplished within 20 days of when protests are filed. It is relatively inexpensive, and as far as we can tell—we have not done a study of this, but certainly our experience in the bid protest community tells us that it has the confidence of a lot of contractors.

I ought to add that one of the reasons I think it has the confidence of the contractors is that the Materiel Command has been willing to overrule commanders in the field who have made judgments about selection decisions. That is a very difficult call for some agencies to make, and there has been a distrust on behalf of a lot of contractors that agencies are willing to do that. The Materiel Command has shown that it has been willing to do that, and I think it has been successful.

Senator GLENN. Mr. DeMayo, do you want to comment on that also? Do you know of any other procedures which have the widespread confidence of the contracting community that might be used for bid protests?

Mr. DEMAYO. Yes, sir, Senator Glenn. I am also somewhat familiar with the Army Materiel Command, and I think they have a good procedure, but I quite honestly speaking from our company perspective, we would mostly elect to go into the GAO for our protests just because of the lack of confidence in a fair hearing.

Senator GLENN. You mentioned in your written testimony that ARWG supports the use of alternative fora to the traditional protest fora. Could you give any more specific examples of alternatives that your members have used and the success or failure of each?

Mr. DEMAYO. Yes, sir. My feeling is, if you start right from the very beginning with the relationship between the companies and the government in terms of contractual relationship, and there is a give-and-take dialogue and trust, you can settle a lot of, call it issues or disputes, before it becomes a protest issue. So that as you work your way up to the award of a contract I think you can do a good debriefing. That to me, that is a very effective way.

I know that was part of FASA, to avoid the issue of protests, so I think prior to award, there is that effective communication to deal with the protest issue. I think there is a lot more that could be done in the process to make protests less of a problem.

Senator GLENN. We are aware of industry's concerns about delays in contract close-out and payment. You mentioned that and commented on it in your statement. I think we all, being realistic, though, recognize that the resources that the government can put into the audit function are limited, and it may not be that possible to speed up the audit process that much.

Do you have any other suggestions or alternatives that industry could offer that would help speed up the process?

Mr. DEMAYO. Well, I think a lot of the issues on contract close-out come down to the final negotiated rates, and admittedly that is a work load issue on the part of the government. I think we are working with the Defense Contract Audit Agency in, call it a process action team, to come up with ways to streamline that process.

So I think there are things that can be done to make that process a little more efficient.

Senator GLENN. You are familiar with the GAO's proposal to delink full implementation of the simplified acquisition threshold from FACNET. What do you think of that? What are your views on that?

Mr. DEMAYO. I think both of those initiatives are excellent initiatives. I think we need to get automation into this process as quickly as possible, but I also think we can make great strides right away on taking full advantage of the simplified acquisition threshold, and I might also add, I really think that small business needs can be fully satisfied with or without the automation.

Senator GLENN. Thank you, Mr. Chairman. I look forward to working with you on this as we go through the year. I am sure we are going to work hard to get the new "Federal Acquisition Improvement Act" through. There may be some changes to it, but I think this is a good followup bill that the administration has put together.

As we work through the process I look forward to working with you, and I appreciate your courtesy in allowing me to be here today.

Senator SMITH. Glad to do it. Are you finished? Do you have any further questions?

Senator GLENN. I am finished, thank you.

[The prepared statement of Senator Glenn follows:]

PREPARED STATEMENT BY SENATOR JOHN GLENN

Mr. Chairman, thank you for the opportunity to attend your subcommittee hearing today on acquisition reform. As you know, this is an issue in which I have long been heavily involved, especially last year with the passage of the "Federal Acquisition Streamlining Act", FASA.

FASA constituted the first major piece of procurement reform legislation in a decade. Passage of the act constituted a critical victory in the war against government inefficiency and one of the most significant accomplishments of the 103rd Congress. FASA is a comprehensive government-wide procurement reform effort aimed at streamlining the acquisition process by reducing paperwork burdens through revision and consolidation of acquisition statutes to eliminate redundancy, provide consistency, and facilitate implementation.

I am proud of the bi-partisan, bi-cameral, multi-committee effort that led to passage of this law, and I look forward to working in that same environment this year as we oversee its implementation and take a look at some further reforms.

Earlier this week I introduced a bill by request of the administration, the "Federal Acquisition Improvement Act". With a myriad of different provisions, this bill represents the next step of improving the way the government buys its goods and services and is a good starting point for this second round of reforms.

It appears that the administration is trying to finish what it started last year with FASA, as well as pursuing some bold new objectives with this bill. I commend them for that. There are sections on further streamlining of the award process; ethics; recoupment of fees paid to the U.S. Government on foreign sales of military products and technologies developed under government contracts; FACNET (the newly established electronic commerce system created under FASA for procurements under the simplified acquisition threshold); and more pilot programs to test out new and different concepts. They are even daring to delve into the contentious area of protest reform. I'm sure Ms. Preston will be testifying to some of this bill's more significant provisions today, but I am pleased to say that I think we are again headed in the right direction.

I am also aware of several other efforts afoot including a bill simultaneously introduced by Senator Roth and Congressman Kasich to reform DOD acquisition management; and a proposal in the works by Senator Cohen to reform the way the government buys its information technology equipment, and I suspect that bill will offer further reforms to the protest system as well.

I am also interested in hearing today from the General Accounting Office (GAO) and Mr. Demayo, the representative from the Acquisition Working Group, about their many innovative suggestions. I have read about some of them and look forward to hearing about them in more depth, particularly the GAO recommendations regarding delinking FACNET with both the permanent raising of the simplified acquisition threshold and pilot programs.

I look forward to engaging in the process and considering all legislative proposals and other ideas again as I did last time. Thank you again, Mr. Chairman, for the opportunity to participate in this hearing.

Senator SMITH. I just have two final points, one for Mr. Murphy.

You recommend that Congress consider allowing the agencies to contract directly with the minority-owned, what is it, 8(a) firms in basically taking the SBA out as the middle man. Is there any advantage to having them as a middle man in any situation?

Mr. MURPHY. The only advantage I have heard suggested is that some 8(a) contractors feel more comfortable working directly with the SBA than with the procuring agencies themselves. I do not know that we have experienced that at GAO. We contract with 8(a) contractors also, disadvantaged minority-owned 8(a) firms. It seems to me that Congress can make some judgment as to whether that is a real value or not.

I really do not know whether it is better to have them work directly with the procuring agency, even though they are perhaps more uncomfortable with that. That is the only advantage I have heard suggested, and we have not evaluated it.

Senator SMITH. I have heard about the comfort level as well. When you have another agency it must certainly increase the cost in some capacity, I am sure.

Mr. MURPHY. Well, it does, and in a way it removes you from your immediate customer. You know, one of the things that the 8(a) program is designed to do is to develop competitive skills among disadvantaged businesses so that they can compete without the assistance of the SBA, and dealing directly with your customers may be an advantage in that case.

Senator SMITH. Mr. DeMayo, in the previous panel I asked Ms. Preston to indicate the top four or five items that she felt we ought to deal with legislatively here, and I don't know that they were 1, 2, 3, 4, 5, but certainly in her top 5 or 10 were bid protest reform, procurement integrity, international trade, and dollar threshold.

From your own experience, would you rank those four up there, and would you add any to the list or delete any from the list?

Mr. DEMAYO. Yes, sir. I would say I would characterize the bid protest thing a little bit differently. My priority would be to put in place the process improvements. Not only to streamline the process, but in streamlining that process I think you more effectively deal with the process issues.

In other words, there would be less protests, and to me that is a combination of things that were passed in FASA, perhaps, with some of these technical corrections that were mentioned, and then some of the things that are in this new legislation. I think together that will go a long way to making the process a lot more effective.

I would agree with the recoupment issue on international competitiveness. I think that's an important item. I think the procurement integrity and ethics issue is also very, very important. Finally I would say there is a package of things that we recommend that I believe are contained in other bills to make the commercial process more effective.

I think we have gone a long way toward commercial products, but I do not think we have yet created the full incentives to get companies who currently do not do business with the government willing to come in and do business with the government.

That would be my list, sir.

Senator SMITH. Well, thank you very much. I thank both of you. I will just for the record state I will extend the period for written followup, if any members have written questions, until the close of business tomorrow, and at that point thank the witnesses, and say the committee is adjourned.

[Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR BOB SMITH

EDUCATION FOR ACQUISITION PROFESSIONALS

Senator SMITH. Ms. Preston, it appears that one prerequisite for the success of acquisition reform efforts is preparing government acquisition professionals to operate as effectively in the commercial marketplace as their private sector counterparts. What programs does the Department have underway to educate, rather than train, professionals for this new environment? Are there changes to the Offense Acquisition Workforce Improvement Act we should consider that would help make this a reality?

Mrs. PRESTON. The Defense Acquisition Workforce Improvement Act (DAWIA) (codified as chapter 87, title 10, United States Code) established specific education standards for DOD's acquisition personnel. For example, to be a member of the Acquisition Corps and, therefore, eligible to be assigned to a critical acquisition position, acquisition personnel must possess a baccalaureate degree and a specified number of business course credit hours (10 U.S.C. 1732). In addition, all contracting officers and contracting specialists (GS–1102s) must have a baccalaureate degree and have either completed 24 semester credit hours of business courses from an institution of higher education or have passed examinations providing the equivalent of 24 hours of business credits (10 U.S.C. 1724).

DAWIA not only established higher education standards, it also provided DOD with the authority to support the course work that would enable acquisition personnel to meet these higher educational requirements. In particular, section 1743 of title 10, United States Code authorizes a cooperative education program; section 1744 authorizes scholarships for the "purpose of qualifying personnel for acquisition positions"; and section 1745 permits DOD to pay for tuition "including a full-time course of study leading to a degree" for members of the workforce.

Since fiscal year 1992, more than 200 students have had coop assignments with the Department and 36 students have been Defense Acquisition Scholars. Workforce participation in tuition reimbursement programs has grown from 3,722 in fiscal year 1992 to approximately 6,000 in both fiscal year 1993 and fiscal year 1994.

DAWIA provides adequate authority for supporting education programs to prepare our acquisition personnel for operating effectively in the commercial marketplace.

Senator SMITH. Mr. Murphy, it is my understanding that the General Accounting Office has done some recent work on the Cargo Preference laws. What are the costs of these requirements to the Department of Defense? Did the GAO find that the Cargo Preference laws were necessary to preserve our defense mobility capabilities? Have you looked at the impact of such laws on the ability of the Defense Department to buy commercial products or components?

Mr. MURPHY. [See letter below.]

UNITED STATES GENERAL ACCOUNTING OFFICE,
OFFICE OF THE GENERAL COUNSEL,
Washington, DC, August 11, 1995.

Hon. ROBERT C. SMITH,
Chairman, Subcommittee on Acquisition & Technology,
Committee on Armed Services,
U.S. Senate

DEAR MR. CHAIRMAN: This responds to questions you posed at the April 6, 1995, hearing before the Subcommittee on Acquisition & Technology, Committee on Armed Services, concerning recent General Accounting Office (GAO) work on the cargo preference laws. These laws require that most government-owned or financed cargo shipped internationally be carried on U.S.-flag vessels. You ask for the costs of the requirements to the Department of Defense (DOD); whether our Office found that the cargo preference laws are necessary to preserve our defense mobility capabilities; and whether GAO looked at the impact of these laws on the ability of DOD to buy commercial products or components.

We reported on the cargo preference laws in our November 1994 report, *MARITIME INDUSTRY: Cargo Preference Laws—Estimated Costs and Effects* (GAO/RCED–95–34). We found that, for fiscal years 1989–93, DOD estimated that the additional transportation costs of the preference cargo it shipped on U.S.-flag vessels averaged about $350 million per year. Most of DOD's preference cargo supports troops stationed overseas. The average was about $482 million per year when the costs associated with the Persian Gulf War were included.

Our work did not address whether the cargo preference laws are necessary to preserve defense mobility, or the impact of the laws on DOD's ability to buy commercial products or components. DOD advised us, however, that its policy would be to ship on U.S.-flag vessels even in the absence of cargo preference laws.

DOD believes that such a policy is necessary to ensure a viable U.S. merchant fleet so that in the event of a major war DOD could rely on U.S.-flag ships for its transportation and shipping requirements.

Enclosed for your convenience is a copy of our November 1994 report.

Sincerely yours,

JEROLD D. COHEN,
Acting Associate General Counsel.

Enclosure.

[GAO report retained in committee files.]

Senator SMITH. Mr. DeMayo, what specific impacts does the recoupment requirement have on your ability to sell defense systems to other countries?

Mr. DEMAYO. Recoupment charges raise the price of U.S. products in what has become an increasingly competitive global market, significantly disadvantaging U.S. industry. Moreover, foreign competition has markedly improved in the qualitative sense with the result that current and future transactions are becoming especially price-sensitive. While quantitative data does not abound since it is difficult to determine precise reasons for not effecting a "sale," it stands to reason that the cost of a product is a meaningful evaluation factor in the purchase decision process—all other things being more or less equivalent.

Of some consequence is the fact that "all other things are not more or less equivalent." To the best of our knowledge, no other government imposes recoupment charges on sales of major defense systems or products sold by its contractors. Quite the contrary, many foreign governments actively assist their defense industries in effecting foreign sales by arranging special financing terms, direct subsidies, and through other means.

Senator SMITH. Mr. DeMayo, has U.S. industry lost a sale as the result of recoupment requirements?

Mr. DEMAYO. Yes. There is documentation to this effect in transactions involving the sale of night-vision equipment. Also, but for the direct commercial sale of to the Swedish government, both Hughes and Raytheon would have lost out in the competition with MICA. It should be noted in that instance the foreign competition actively lobbied Congress to urge DOD to impose a recoupment charge, which would have increased the price of the U.S. product by more than 30 percent. Only by recourse to a direct commercial sale was it possible to remain price competitive.

Senator SMITH. Mr. DeMayo, why is it unreasonable to expect foreign customers to reimburse U.S. taxpayers for the cost of developing defense equipment that they are purchasing?

Mr. DEMAYO. When the U.S. taxpayer invests in the development of a major defense system, a full return on that investment is realized when the resulting system is operationally fielded. At the time of the initial investment, there is no expectation, let alone an assurance, that at some future date foreign military sales will materialize. It is extraordinary for there to be foreign military sales concurrent with the initial production and delivery of major military systems to the U.S. military.

Alternatively, in those instances in which the DOD procures military hardware developed and manufactured by foreign defense industries, there is no recoupment charge within the purchase price. As a consequence, many foreign governments perceive themselves as being treated unfairly when confronted with such charges by the DOD.

Foreign customers have alternative means whereby recoupment charges can be avoided, such as direct commercial sales. For a variety of reasons, our government may prefer the transaction do be conducted as a FMS case—political or military in nature. The elimination of recoupment does not necessarily, therefore, give up anything of value vested to the U.S. taxpayer but does give the DOD greater flexibility in managing such transactions.

The U.S. taxpayer benefits directly and significantly from foreign sales, even absent recoupment of nonrecurring R&D. Such sales increase the contractor's business base, making the recurring costs of producing concurrent quantities for the DOD less expensive. In addition, it helps ensure a continuing source of initial and replacement spare parts at lesser cost to the DOD. Should there be a need for the DOD to engage in military operations in conjunction with our allies, use of common weapon systems and a common logistics support system is not only extremely efficient in the military sense, but significantly more cost effective.

Last, and especially meaningful in a period of declining defense budgets, is the fact that foreign military sales help maintain the defense industrial and technology base, and preserves production lines should there be need for the DOD to reinitiate or surge production because of changing military threats.

[Whereupon, at 4:16 p.m., the subcommittee adjourned.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1996 AND THE FUTURE YEARS DEFENSE PROGRAM

FRIDAY, MAY 5, 1995

U.S. SENATE,
SUBCOMMITTEE ON ACQUISITION AND TECHNOLOGY,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

REVOLUTION IN MILITARY AFFAIRS

The subcommittee met, pursuant to notice, at 9:05 a.m., in room SR–222, Russell Senate Office Building, Senator Bob Smith (chairman of the subcommittee) presiding.

Committee members present: Senators Smith, Nunn, and Bingaman.

Committee staff member present: Christine K. Cimko, press secretary.

Professional staff members present: Jonathan L. Etherton, John H. Miller, Thomas G. Moore, and Eric H. Thoemmes.

Minority staff members present: Arnold L. Punaro, minority staff director; Andrew S. Effron, minority counsel; John W. Douglass and Michael J. McCord, professional staff members.

Staff assistants present: Pamela L. Farrell and Deasy Wagner.

Committee members' assistants present: Thomas L. Lankford, assistant to Senator Smith; Glen E. Tait, assistant to Senator Kempthorne, Richard W. Fieldhouse, assistant to Senator Levin; Steven A. Wolfe, assistant to Senator Kennedy; John P. Stevens, assistant to Senator Glenn; William Owens, assistant to Senator Robb; and John F. Lilley, assistant to Senator Lieberman.

OPENING STATEMENT OF SENATOR BOB SMITH, CHAIRMAN

Senator SMITH. The subcommittee will come to order.

Good morning, gentlemen. I think Senator Bingaman is on the way, so we will have at least two Senators here.

This is a hearing that I have been looking forward to and others have been looking forward to as well, concerning this so-called revolution in military affairs. It is a fascinating thing. I think sometime 50 years ago maybe somebody was sitting around the table thinking about what it was going to be like in 1995, and I am envious of those who can look that far out and have some idea of where we might be.

Over the last few years the Pentagon and the defense community have undertaken a series of studies and experiments to determine if we are facing a fundamental transformation in the conduct of warfare. This question has been prompted by the advent of many unique, new technologies and theories of warfare which, if exploited to their full potential, could literally revolutionize the art of war.

This discussion is particularly timely in light of the dire resource shortfalls that we are experiencing and the need to maximize our return on defense investments. I guess I do not need to tell you gentlemen that all of us here, both on the staff and the committee, are quite concerned that we are probably looking at a flat defense budget for the next 7 years with literally no growth. We are going to have some real tough decisions to make. If we are in fact on the verge of revolution in military technology, the decisions that we make in terms of investment strategy and organization will have historic implications for our military. We need to make certain that those decisions are sound and that military requirements, not merely budget imperatives, drive our defense programs.

In the past we have seen revolutions in the conduct of war based on technology and on doctrine. In this century alone we have seen the development of jet aircraft, tanks, ballistic missiles, and even nuclear weapons literally revolutionize warfare as we now know it. In each case the technology and, perhaps more importantly, the application of that technology provided a decisive change in the global military equation which changed the course of history.

Today, new developments such as stealth technology and precision-guided munitions have again changed the nature of warfare and challenged traditional concepts of force packaging. Advanced simulation and modeling has enabled us to better visualize today's battlefield and train more efficiently for the future.

As the chairman of this subcommittee, I am convinced that we must continue to challenge traditional concepts of warfare and expand that envelope of technology innovation. Desert Storm was an enormous success. Sometimes I think we dwell too much on it in the fact that that was the past, believe it or not. It seems like it was recent, but it was the past. It was 4 years ago and our adversaries unfortunately now are pretty familiar with the technology that we used in that conflict and, to some extent, the strategy.

We have neither the force structure or the personnel to fight Desert Storm the way we did in 1991, and I do not think we should try to. Instead, we have to focus on fighting the wars of the future. Hopefully, there will not be any but we have to be prepared and we must assess the threats to our security and develop a technology investment strategy that preserves that military superiority.

In conclusion, let me just say it is my hope that this hearing will focus on the full committee's attention on these issues and to help us develop specific strategies for the legislative as well as funding decisions that we are going to have to make during this Congress and in the near future. We also seek to gain a deeper understanding of the issues surrounding the current debate over the military affairs and the technological revolution.

Let me just conclude on these three points. Funding. What dollars do we need not only in this subcommittee but, I think, across the defense budget? What is the funding level that we are going to have to prioritize to be able to deal with this concept of revolutionizing warfare?

Second, is the organization of DOD, with respect to Goldwater-Nichols. Is Goldwater-Nichols dealing effectively with this new revolution in warfare? For example, do the Joint Chiefs and others in the Pentagon have sufficient access to the intellectual community? Are those who are out there thinking way out ahead in terms of where the future should be in warfare getting access to the Pentagon?

Finally, Acquisition Reform itself. Unless DOD can integrate leading-edge technologies from commercial into the defense system quickly and continuously, this revolutionary change is not going to take place.

These are just some thoughts that I wanted to throw out as we start the hearing this morning. Senator Bingaman?

Senator BINGAMAN. Thank you very much, Mr. Chairman. I thank the witnesses for being here.

I have had the good fortune to visit with Admiral Owens on some of his thoughts on this issue of dominant battlefield awareness and I very much look forward to hearing his testimony. I think it is very important as we go forward.

Also I have heard Andy Marshall discuss how the Navy made excellent use of the period between World War I and World War II to develop its concepts of how to use aircraft and aircraft carriers.

I am obviously anxious to get any views the witnesses can give us as to the appropriate level of commitment to research and development for us in the coming years, how we deal with the new availability of technology to our potential adversaries, and the fact that since much of the technology we are now most dependent upon is commercial in nature, how do we deal with that?

One example, which I have discussed before and I know the witnesses are focused on, is high resolution satellite imagery. If that sort of technology is available commercially, is it reasonable to assume that we will be the only ones in a potential conflict in the future with the capability for this dominant battlefield awareness? What advantage will we really have in a world where we depend upon commercial technology that everybody else has as much access to as we do?

Those are some of the issues I am looking forward to exploring. Thank you for scheduling this hearing, Mr. Chairman.

Senator SMITH. Thank you, Senator Bingaman.

I would like to welcome the witnesses: Admiral Owens, Vice Chairman of the Joint Chiefs, and Andrew Marshall, the Director of the Net Assessment of the Department of Defense, and also, Admiral Owens, your wife Monica, who I understand does not attend your hearings too frequently. I gave her the opportunity to question you and she turned it down. She said she would do that at home. [Laughter.]

I understand you have an opening statement, Mr. Marshall. Why do you not go ahead and proceed?

STATEMENT OF ANDREW W. MARSHALL, DIRECTOR, NET ASSESSMENT, DEPARTMENT OF DEFENSE

Mr. MARSHALL. Thank you, Mr. Chairman.

In my verbal opening statement, I thought I would address some of the questions that you posed in the letter that was sent as an invitation, but I will begin before that with just saying a few words about this whole notion of a revolution in military affairs.

I have been struck in the general public discussion with what seems to me a good deal of terminological confusion. The essential point about the whole matter is, if you look at history, you see that from time to time there are these periods where very significant change takes place in warfare over relatively short periods of time, 20, 30 years. It does not happen overnight because you are talking about changes in large organizations, their equipment, how they fight, and so on.

So, the most central issue for us, I think, is to decide whether we think we are in one of those periods. Some years ago, we did an assessment to address that issue and concluded that the answer is probably yes. We are probably at the beginning and that in this case information technologies were to a large extent driving the changes in warfare; but, we also live in a very changed world. So, we have a situation in which there is a major geopolitical transition taking place and superimposed on that is this rapid technological change which I think will also change warfare.

It is important to make these judgments because if you come to believe that, then there are a number of strategic management issues that the top management in defense has to face. And I will come to that.

Now, as to what the Defense Department is doing, I would list first that in late 1993 the Secretary of Defense established a Steering Committee initially under John Deutch. Paul Kaminski is now the chairman. There are a variety of activities that have started as a result, several task forces, and I am sure that activity will continue as an effort to institutionalize a focus on this issue. Admiral Owens in the Joint Requirements Oversight Council (JROC) effort is certainly part of all of this. Several of the services have efforts to look at future concepts of operation. The Army probably has the most systematic, organized effort.

We have been doing a number of things in my office, we have a whole series of war games that mainly are situated in the period 2015, 2020 where we are trying to get people to explore future concepts of operation and organizational changes that would be appropriate. Some of these games are run in conjunction with the services. Some are games that we direct. I also have undertaken an effort on behalf of Admiral Owens to explore the consequences of dominant battlefield awareness, what change that would really make.

I have had a number of historical studies done, especially of the 1920s and 1930s, which seems to me an interesting period with some parallels with the situation we find ourselves in.

We have initiated an essay contest for junior officers to try to increase the intellectual attention to this issue of a potential revolution in warfare. You also have the advanced concept technology demonstration that Larry Lynn began which seem to me also pushing in exactly the right direction.

I would close with your question on Congress' role. One of the things that certainly comes out of the histories of the 1920s is that Congress has played a big role in the past in these major changes and it has tended to be one of a partnership with the innovator. Admiral Moffett and the people changing the Navy during that period were very much involved and supported by various people in the Congress.

My feeling is that we are at the very beginning of a 20-, 30-year period of significant change. One of the important things in the near term is this search for a vision of the future, what are the concepts of operation that will really make full use of the technologies and solve the military tasks that we will have in probably a quite changed world, especially 20, 30 years from now. There probably will be a new set of major powers, a different situation for us than we have at present.

So, initially it is an intellectual issue of where do we think we really want to go. But soon it will become one of experiments, field experiments, and we have got to find a way to make the acquisition system support innovation and experimentation because we can probably do a lot more than people in the 1920s were able to with gaming and simulation. In the end you are going to have to get some pieces of equipment out to field test experiments that try out the concepts of operation. It seems to me that the Congress will play a major role in all of that.

So, thank you for inviting me and I look forward to your questions.

[The prepared statement of Mr. Marshall follows:]

PREPARED STATEMENT BY ANDREW W. MARSHALL, DIRECTOR, NET ASSESSMENT, DEPARTMENT OF DEFENSE

REVOLUTIONS IN MILITARY AFFAIRS

The Office of Net Assessment and others are investigating the hypothesis that over the next 20 to 50 years a military revolution will transform the way wars are fought. This hypothesis is mainly based on a judgment that technologies already available and foreseen have created potent new military possibilities not yet practiced or even fully understood. Historians report military revolutions in past eras which were made possible by the invention of new technological instruments and brought to fruition by the adoption of new ways of organizing and operating forces to take advantage of those instruments. Examples of this in the 20th century include the development of armored warfare, carrier aviation, and nuclear-armed ballistic missiles. We do not yet fully know what the next revolution will bring about or certainly that a new revolution is in the offing; but a military revolution would be a development of fundamental importance to DOD, so it is important to try to understand the possibilities as best we can.

The term "revolution" is not meant to insist that the change will be rapid—indeed past revolutions have unfolded over a period of decades—but only that the change will be profound, that the new methods of warfare will be far more powerful than the old. Innovations in technology make a military revolution possible, but the revolution itself takes place only when new concepts of operation develop and, in many cases, new military organizations are created. Making these organizational and doctrinal changes is a long process. But even if the revolution takes 20 or 30 years it is important to develop early on some vision of the direction in which you want to go, and then refine it through games, exercises, and field experiments. The most compelling lesson that comes from looking at the 1920s and 1930s and at the first few years of World War II is that some military establishments were much better than others in developing appropriate concepts of operation, making the organizational changes, and creating the doctrine and practices that fully exploit the available technologies; and that superiority in these respects had large military consequences.

What might this revolution be like? There are two major ideas about how warfare may change that now seem very plausible. The first is that long-range precision strike weapons coupled to very effective sensors and command and control systems will come to dominate much of warfare. Rather than closing with an opponent, the major operational mode will be destroying him at a distance. Thus far, this idea has been elaborated most in connection with a large continental air-land theater, but it seems plausible that long-range precision strike operations may also play a very prominent role in power projection, war at sea, and space.

The second idea is the emergence of what might be called information warfare. The information dimension or aspect of warfare may become increasingly central to the outcome of battles and campaigns. Therefore, protecting the effective and continuous operation of one's own information systems, and being able to degrade, destroy or disrupt the functioning of the opponent's, will become a major focus of the operational art. Much as over the last 60–70 years one wished to obtain air superiority in order to better conduct all other military operations, in the future obtaining early superiority in the information area may become central to doing well in warfare.

Over the course of the last couple of years, an effort has been made to clarify this potential military revolution. We have conducted a number of historical investigations of past periods of major change, in particular, the 1920s and 1930s. The purpose was to understand what these periods were really like, how major innovations came about, and lessons that could be learned about the innovation process in large military organizations. We have conducted a number of wargames that are placed in the period 2015–2020 in an effort to search for new concepts of operation and organizational adaptations that might be useful. We have also held roundtables with all of the services to understand their ideas. We have initiated an essay contest to involve younger officers.

At the moment, we ought to see ourselves as being in the equivalent of the early 1920s. Ideally we can repeat the successes of the wargamers at Newport and the fleet exercises of the 1920s to discover the best concepts of operation adapted to the technology and the strategic environment that the United States may face in the future. With an active effort at wargaming and by beginning various field experiments, we could in the next 3 to 5 years reach the point the naval innovators reached in the mid 1920s.

There are a number of things one can be concerned about:

- The high op tempo of our forces makes it more difficult to focus attention on the more distant future and major innovations, or to conduct field tests and experiments.
- The character of this revolution may pose some special obstacles to innovation. The available technologies may not produce a distinctive new platform that creates some conspicuous type of capability, but they will change the character of many existing weapons. The technologies make warheads smart, they allow us to fly the airplanes we now design, they allow much more effective sensing of the environment and the coordination of all elements of a military force. One conjecture about the future is that it is this new effectiveness in sensing the environment and in the coordination of all the elements of one's force that will be the major source of the improved capabilities. In contrast to the 1920s and 1930s, when innovation would begin in a specific sub-organization (e.g., naval aviation) and only gradually assume its dominant role, the prospect just described implies that in some sense one has to change the whole organization at once, if only gradually. If integration and coordination are central to this revolution, the leadership of our services and of the Defense Department will have to play a far more central and active role than they had to in the 1920s.
- A final concern is essentially an intellectual and analytical one. We are in an odd situation where many people believe that it is the information aspects of warfare that may be increasingly determinant of the outcome of engagements of battles and campaigns. Yet it is precisely this aspect of warfare that our current modeling and analysis tools are least capable of addressing. Changing this situation over the course of the next 5 to 10 years should be a major goal.

Senator SMITH. Thank you, Mr. Marshall.

Admiral, do you have any opening remarks that you would like to make?

STATEMENT OF ADM. WILLIAM A. OWENS, USN, VICE CHAIRMAN, JOINT CHIEFS OF STAFF

Admiral OWENS. Well, Senator, thank you for inviting us. It is a pleasure to be here to talk about something that I think Andy and I both think is very important. I would make just a couple of comments to lead into the way we have been thinking about this. It does seem to me that we are faced in the U.S. military today with four essential revolutions.

The revolution of the world is obvious.

The revolution in the defense budget. It is down. I am not saying that is wrong, but the budget has come down significantly, as you know.

The revolution in jointness, and that is really a revolution if you look at the way we are doing business. You all in the Senate were the sponsors of what I think was very visionary legislation to establish jointness, to get us focused on doing things together. A lot of things have happened there that directly relate to the establishment of organizations to bring innovation to the stage for our military.

Finally, the revolution in military affairs, which I believe may be closer even than where Andy's caution would leave us. I believe that it is not a matter necessarily of a lot more money. It is a matter of vision and courage to implement it.

So, I believe those four revolutions sort of set the scene for us as we look at our budget, as we look at the kinds of decisions we are about to make in terms of not evolving, but allowing ourselves to have the courage to do radically different things if it makes good sense for our country and for our military.

At the heart of all of this I believe is not just the individual technologies. There are many things at the heart of how we react to the four revolutions, but it is not just individual technologies; it is not just data processing or band width. It is the ability to put it all together in systems of systems, and this is where I think our country genuinely has the lead now and will continue to maintain the lead for the long term.

Here is an area where we have not been particularly innovative I believe over the centuries, over the decades: the conceptualizing of how you put these things together. I think Andy has talked about one example of this was when the carriers came along and we had the ability to put a large platform at sea. We had aircraft that were now capable, and we had radios. So, there was a system of systems that started to come together then.

But here we have a much more complex system of systems that we are addressing as we look at improved surveillance of a battlefield, the ability to communicate that surveillance to the warrior, and then the precision weapons to do something about it. I think they are the three essential parts, each of which is a system. But the system of the systems then starts to make a lot more sense if we can develop the vision about how it can be put together.

The issue is, of course, always to some extent money, and we are all focused on that as we downsize the budget, as you are. But I think that most of the things that matter here are in the budget already. Most of the things are in the surveillance category, HASA or SBIR or the UAV, ACTD, in the C^4I MILSTAR, and the many communications programs and the precision weapons programs are essentially there.

The issue is really one of vision and courage, I believe, as we look at what is in front of us and how to bring it to concept, bring it to organization, bring it to doctrine, to make it actually come true, and to fill the vacuums in the areas where the technology is not quite in place yet.

An example would be automatic target recognition. If we are starting to see a large battlefield on a 24-hour-a-day, all-weather basis, then automatic target recognition leaps to the top as the technology that will energize that kind of capability. In other words, in a very large battlefield, the ability to recognize particular units, a T–72 tank or a TEL or whatever.

In all of this, Goldwater-Nichols has been helpful because Goldwater-Nichols essentially said that every year the Chairman of the Joint Chiefs should submit to the Secretary of Defense his assessment of the budget and the program. That was done last September with the first all-inclusive Chairman's program assessment. When General Shalikashvili submitted that to the Secretary, it had many, many programs in it, some of which pertained to what I believe is the revolution in military affairs.

This was a way for us, the four-star military which had worked in the JROC sort of top down, because I believe top down is very important if we are trying to make these kinds of changes in a system, to work with our CINCs, with our Commanders in Chief, with the Joint Chiefs, and then finally to submit via the CPA the Chairman's program assessment, from the Chairman to the Secretary, our recommendations for what needs to be funded in the budget and the program. So, bringing these things to the table I think is extremely important.

Your help in Goldwater-Nichols and in bringing the revolution in the way our military is organized is directly related I believe to our ability to realize the kinds of changes and revolutions in the technologies that we are discussing here this morning.

Many of the innovations of the past I believe have been people specific. That is important, of course, and we have had some marvelous innovators in our military and civilian leadership in the past. But whatever we can do to bring process to this so that it is okay to innovate is important in my view. It is okay to talk about ideas that are not exactly center of the road, and it is okay to do it at a high enough level so something can happen with it.

So, we have been working hard on the issues of how we do that and how we develop in our young people in our war colleges—I have tried to give a lot of speeches to young people in the war colleges about how important it is that they have the courage to innovate. Many of them have good ideas. We have very bright young people in our system. The issue really is do we have the courage to allow them and do they have the courage to step forward when they have a good idea.

So, you see, for example, the mobile sea-based model sitting outside my office. It is there not as a model of the mobile sea base. It is a model of the encouragement I hope for every young officer, for every captain or colonel to have the freedom to say what he thinks is right. If we at the higher levels can talk about things that are a little off the ranch, but seem to be good ideas, then it may be okay for our younger officers to do the same.

So, I think all of these are elements of the revolution in military affairs.

I think my colleague, Andy, has been a tremendous leader in this. I must say it has been important to me, when I was a young captain, to have Andy Marshall down in the front offices of OSD where I could stop and talk about innovative ideas. It was a place where I was not going to be hurt by talking about it and where we could chat about things that were going on in Andy's world and mine even when I was a captain of a submarine. Then when I came back to the Pentagon, Andy was there. I could still continue this. So, Andy has a legion of people he has brought along as an element of being sort of the godfather of innovative thinking. So, that kind of mentor for this is a very important part.

I thank you very much, sir, for inviting us here this morning.

Senator SMITH. Thank you, Admiral.

Let me start it off on this point. One of the criticisms of DOD's current approach to the concept of the revolution in military affairs is the debate that all the activity, all the discussion is devoted to what we would call the dry stuff, the technology, the operational issues, and not enough to the political and the strategic.

Let me give you two historical examples. In the 1960s—it is a little bit off the subject, but the same issue—when Kennedy said we will put a man on the moon, he threw the concept out and everybody scurried to make the concept a reality. I think Reagan's strategic defense initiative was another example.

It seems to me it is certainly a lot more colorful and a lot more interesting to do it that way. Maybe if you can gin it up, you can get the support for the types of things that you need, as was the case certainly with Kennedy's man on the moon, not quite as successful with the SDI, but a portion of it.

I would like your comments on that as to whether that would be a good strategy or a bad strategy or somewhere in the middle. Mr. Marshall?

Mr. MARSHALL. Well, I think that we do need to look farther ahead than has been the case, and it is one of the reasons, among others, that I have focused a lot of the games that we are doing out 2015, 2020. I think that we do need to address this issue of what we think the world might look like then and that there has been a little too much focus on the world as we see it and can expect it to be in the next few years. I personally feel that there is a tendency to discount any really truly major future challenge, a large adversary.

Again, one of the things that comes to my mind out of the work we have done on the 1920s is it was not just us who got much of the naval answer right during the 1920s and the 1930s, but also the Japanese. Japanese GNP in 1938 was probably somewhere between 10 and 15 percent of ours, and yet by having the right ideas about how to use the available technologies, they certainly gave us quite a run for our money.

So, there is the possibility of really significant challenges in the future. Even though one cannot say it is this particular country or some other country, it is something that I think we need to begin to think about.

Senator SMITH. But those of you who are working behind the scenes with these innovative concepts and trying to make them a reality, is it not helpful if some political leader or leaders somehow endorse at least the concept of what you are trying to do? Obviously, that encourages you a little bit in the laboratory, does it not?

Mr. MARSHALL. Yes. Certainly I think that would be helpful. One of the things that I will be reporting on later this month to the Revolution in Military Affairs Steering Committee are things that might be done to foster innovation. One of the things I will certainly raise is the issue of leadership actions that could be taken. So, I think that what you say is correct.

Senator SMITH. Did you want to comment, Admiral Owens?

Admiral OWENS. Well, I agree with you, Senator, that this is an important thing for top-down, political, strategic statements that facilitate the kinds of work that allow us to bring the greatest efficiency and effectiveness to the way we do our business.

There are some examples of this that mean a lot to us in the JROC in the way we try to implement the technologies that are available to us. I might just mention that some of them are political constructs, but we take them very seriously. PFP, for example, does not seem at the front edge to be a necessarily technology-oriented sort of construct, but the Partnership for Peace to me has meant when I make a visit to the country like the Czech Republic, for example, this is an opportunity for us to develop a dialogue with a country, a new friend, the United States, in the context of NATO in the context of building this alliance, and in the context of these technologies.

So, I have, when I visited these countries, in the context of PFP and engagement, both of which are a part of the national security, national military strategy, undertaken to talk about the new technologies that are available to all of us, not just America, but the fiber optic grid and what does it mean. Some of these countries may not have heard of the fiber optic grid. What does it mean to us as military men to be able to exchange 10,000 times as much data as we do today, or the ability of the global cellular net, or the ability of direct broadcast satellites available quite easily to us and our allies in the future to take advantage of some of the things that might be available to us? So, PFP does open some doors, for example, and it is in the context of what you said.

Weapons of mass destruction is a clear element in the policy that is laid out in the national security strategy. So, there are many elements of this, as you well know, and we are addressing those in a technical, as well as a political way.

Senator Nunn has, of course, been a principal player, as you have, in the Nunn-Lugar issues associated with WMD. So, that has some technical, as well as some political, strategic meaning to it. We focus a lot of time on trying to implement the things we are doing to be in line with that strategy.

Senator SMITH. I will turn the questions over to Senator Bingaman.

Just a comment. I would encourage you to develop that rapport with the political leaders regarding these concepts, whether it be the President or Members of Congress or anyone else because I think it helps if you really feel strongly about the concept and you think the concept is workable.

I would just recall one more example. There have been focus groups conducted recently around the country on national missile defense, for example, in which people are put behind a screen and asked the question, what do you think America should do if we are fired upon with a ballistic missile from another country, and the answer is, shoot it down. The truth of the matter is we cannot shoot it down, and I think if someone were to address that issue with vigor at the national level, then I think that concept would move up pretty quickly, a lot more quickly than where it stands now. But that is just one example. That concept is a lot closer than what we are talking about today, which is further out.

Senator Bingaman?

Senator BINGAMAN. Thank you very much, Mr. Chairman.

Let me ask if I am correct in my thinking about what you are talking about with this revolution in military affairs. A friend suggested the other day that the real revolution is a result of the fact that in the Second World War, most of the bombs we dropped did not hit the targets they were aimed at and most of the other warfighting that we did was very inefficient. This is the reason we expected to hit the target about 1 time out of every 400 times we dropped a bomb. Now that has changed substantially and we are able, because of all of the new technology that is available, to expect a much higher rate of accuracy in what we do.

I guess the other piece of this revolution in military affairs may be the enormous destructive power of some of the things that we are able to use, nuclear weapons or other types of weapons of mass destruction, which if you combine the ability to hit the target with the enormous additional destructive capability of whatever you are aiming at the target, it seems that you have a whole different set of circumstances than we used to have.

I would be interested in either one of you just commenting. Is that what we are talking about in this revolution of military affairs, or are you talking about something different?

Admiral OWENS. Well, Senator Bingaman, I think the accuracy element of this is a critical part of it certainly. GPS and all of what GPS and the improved mapping of the world has given us is an ability to have a common grid which we have never had in the military before. Not even between two ships at sea have we had a common grid and a common reference system for the contacts that we may have had on the two ships let alone across four services. So, GPS and improved mapping of the face of the earth have given us a tremendous leverage to set the scene for improved weapons. This accuracy is an extremely important element.

I believe that this gives us many, many advantages. It is not only the advantage of being more effective in the lethality of the weapon, but you may actually be able to downsize the weapon. If you are able to hit a target with very, very close accuracy, then you may not need a 500-pound bomb. You may be able to use a 250-pound bomb. And if you have an airplane with a certain capability, then you may be able to put a lot more 250-pound bombs in it than you could 500-pound bombs, obviously.

It also plays around in the logistic cycle because if you can downsize the weapons, then you can also downsize the number of ships, the number of airplanes that are necessary to make it come true.

So, I think my view on this is that while we, of course, have to be very aware of the nuclear capability and need to continue to have it available for us, that the real revolution here is the ability to use these precise weapons with even smaller warheads to do very lethal things.

I think in the context of not only accuracy and destructive power, there is another one and that is the size of the battlefield. Here I think is where the revolution in military affairs genuinely lies. It is the ability not to see a 25 by 25 mile battlefield, but the ability to see a 200 by 200 mile battlefield. If you see the battlefield, if you have more or less knowledge of what goes on in that entire large battlefield—that is, where the radars are, where the communications transmitter is, where the concentrations of armor are on that battlefield—then I have been saying for the first time you will play strategic chess in that battlefield. I think that is the revolution.

I think when you see the battlefield 24 hours a day, all weather, real time in considerable fidelity, you can for the first time perhaps, to the extent that this is true, play strategic chess on that chessboard because we have never seen all the players before. We have moved our pawns and our kings and our queens without knowing the location of the pawns, kings, and queens of the other side.

So, for the first time, perhaps, we will have a lot more knowledge about where their pieces are, and then you can deal with strategic centers of gravity rather than force on force, and we can use the precision of these new weapons and GPS and the communications systems that we have to bring genuine fire power in a strategic way to a large battlefield.

Senator BINGAMAN. Let me just ask Admiral Owens. I have heard you say before and again today that our comparative advantage is that we can put together the system of systems and we can integrate this better than our potential adversaries. That is the case today and that will be the case in the future.

I guess I do not doubt that it is the case today. I wonder how well we can maintain that comparative advantage. Unless we are going to dominate space to the exclusion of others, what are we going to have available to us that a potential adversary would not have available to them in the way of information, in the way of technology, particularly since much of this technology is commercially available and can be bought from any number of sources?

Admiral OWENS. Yes, sir. Well, it is, of course, a very complex discussion, but my sense is that we have the potential to put together a system of systems that no one else will be able to put together in the rest of my lifetime. It comes from some very unique military technologies that fit together with the commercial technologies that you mentioned, and it is a conceptualization of things, many of which are quite expensive, some of which are available openly on the commercial marketplace.

But if you see the construct, the architecture of the entire system of systems in some fidelity as the next year or two goes on, then we can start to see how we can protect it, how you can make it degrade gracefully rather than make it such that it will fall apart on you when you need it most. So, we have done a lot of architectural work in the JROC in this regard.

You find, for example, in communications that while there may be communications available to all of us in the world, available from commercial technologies, that we have this very important need for command and control communications from the President to the soldier in that battlefield that is going to be very difficult to do with the commercial technologies that are becoming available to us.

But we have MILSTAR, and MILSTAR provides this relatively low band width, but a very, very secure, very survivable, very mobile communications system which is a very important element of the system of systems. But it does not provide the band width. So, here we need to have that direct broadcast satellite or possibly in the future fiber that goes to the battlefield that will give us that kind of wide band communication which does not have the need to be quite as anti-jam, quite as secure, quite as mobile perhaps as the securer chain of command communications.

So, we have done a lot of thinking about the structure, the architecture, not only of the communications part, but also the surveillance part. Here, too, there will be satellites that will be available to an enemy in the future. But there are vulnerabilities of these systems that we must be thinking about, and we do a lot of thinking about them. But we have systems that will be a little less vulnerable.

So, when you put the system of systems of surveillance, communications, and then precision weapons together, tie it together, and then look at it from a sort of red team concept to see how vulnerable it might be, I have been convinced that if we spend a lot of time on the architecture and the conceptualization, that we will be able to put it together in a way that no other country will be able to, that it will degrade gracefully if threatened, and that it is something that can be very important in this revolution in military affairs.

Senator BINGAMAN. Thank you very much.

Senator SMITH. We are delighted to have the distinguished ranking member of the Armed Services Committee here this morning. Senator Nunn?

Senator NUNN. Thank you, Mr. Chairman. Thank you for having this hearing. I wish we had the entire committee here today. I wish I could have been here for the whole time because what I have just read and gathered in the brief time I have been here and knowing the two witnesses we have—I am sure you have got very interesting testimony to follow—this may be one of the more important hearings we will have this year.

I congratulate you and Senator Bingaman, Mr. Chairman, for having this hearing and for focusing on this look ahead. Most of us get caught up so much in the day-to-day activities and fighting the current battles in the budget and putting out fires, we do not take the time to look down the road. I think this is indeed doing this.

Mr. Marshall, of course, you have been a leader for a long time in thinking down the road.

It is interesting. In your written statement here, you say, "A final concern is essentially an intellectual and analytical one. We are in an odd situation where many people believe that it is the information aspects of warfare that may be increasingly determinant of the outcomes of engagements in battles. Yet, it is precisely this aspect of warfare that our current modeling and analysis tools are least capable of addressing."

I am interested in that last point. Could you elaborate on it and tell us what we are doing to try to get our analytical tools better qualified to deal in this information revolutionary period?

Mr. MARSHALL. Senator, let me first expand a little bit on what I meant.

There is this view, which I very much share, that it is in these information aspects of warfare that in some ways the revolution really is most centered. Therefore, our effectiveness is going to be significantly increased by our ability to both sense the environment better and then to coordinate our forces and optimize their use in ways that have become possible.

But if you look at our models, they either operate on the assumption that the command and control system is all there, and the models mainly derive from the last 30, 40 years of analysis effort and come out of an acquisition focus and are designed to evaluate questions such as is this the right bomber, is this the right missile. So, it has mainly been designed to evaluate the delivery systems.

When people have looked at the command and control aspects—and that is only to a limited view in itself—and what would happen if it is attacked, the analysis is always to determine. Does this node disappear? If part of the system is destroyed, will what remains carry out the task of getting particular messages through? It does not deal very well with jamming, let alone deception, or if an opponent were skillful enough to insert false information into the system.

Senator NUNN. How do we begin to change that?

Mr. MARSHALL. Well, what we are going to have to do is undertake a systematic effort to get at this aspect of warfare, and it is going to have to be a matter initially of developing the appropriate intellectual framework and then modeling.

A little while ago I put together a group to try to come up with a plan for what you might do, and I hope to move forward with that.

I have been having an exchange of memoranda with Admiral Owens for the last 2 or 3 months about this issue. I think it is a very central issue and something that we need to get on with, and I believe that we will.

Admiral OWENS. I wonder if I could say just a couple of words, sir.

Senator NUNN. Okay. I want to ask a couple more questions.

Admiral OWENS. I am sorry. I did not mean to interrupt.

Senator NUNN. Go ahead but, if you could, make it brief because I want to ask you a couple more things.

Admiral OWENS. There are a couple of specific efforts going on to develop particular models that deal with this area of surveillance and command and control and how that is modeled. I agree with Andy. It is not modeled now. We have ASW models, anti-submarine warfare. We have force-on-force ground models, but we do not have models that do this.

So, if it is true that you can see the battle space in increasing fidelity, then it is important that we model that. The satellite contributions, the UAV contributions, the air-breathing aircraft contributions and how they all fit together and what do you know about the battlefield is not modeled or simulated today. So, if it is an important part of the revolution in military affairs, we have to do it.

There are two efforts. John Deutch and I have led an effort with Paul Kaminski involved to upgrade what is presently the model we have been using for the last 10 years. It is called Tac War. There is a significant effort ongoing to apply several million dollars—I think it is about $14 million or $15 million—to Tac War to upgrade it in the next few months, in the next 12 months, to bring this kind of reality of the battlefield to Tac War.

On a parallel path is another model called JWARS which will cost about $30 million, as I recall, which is a much broader model that has from the beginning an object oriented approach that will bring a reality to this kind of system, sir.

Senator NUNN. It seems to me we have kind of got to move in two directions. One is continue to move boldly forward to think in the future and to make sure we are on the cutting edge of all of this information type revolution as well as the precision-guided weapon and standoff weapon revolution as identified in your testimony.

But the other side of it is I do not see a challenger out there in this respect for the next 5 to 10 years, maybe longer, in the sense of someone being able to maintain the pace that we will be able to maintain in these two revolutions mainly because of economic conditions around the world. I do not forecast that will be true 15 years from now, and I think we have to look much further and we have to be the number one in this area because it is the wave of the future.

But I sense that we are going to have two other challenges, and I would like to get your views on both of these ideas.

One is it is going to be a world where the enemies of the United States, indeed the enemies of civilization and humanity, are going to move more toward terrorism. While we are moving to the upper tier, they are going to be moving toward the lower tier. That terrorism is going to take many different forms. Increasingly there are going to be calls on the military, hopefully not to get out and arrest people and get into seizures and all of the law enforcement functions. I would oppose all but the military's involvement in the information part of this, intelligence part, the counter-terrorism part in terms of many aspects we may not even be able to foresee.

The question is, are we playing in that arena? While we are moving to the high tier, are we also thinking backwards into the low tier because that is where I think the competition is going to come?

The other area I would throw out. I think the Chechnya experience the Russians have had, which has got to be a serious blow to their military morale, the way they have handled that situation both with the lack of humanitarian concern and also ineptness, and also the demoralized military, the conventional forces having gone down very, very substantially, I think they are going to move almost predictably more and more toward relying on nuclear weapons, backward, not forward. That is not something I think they will welcome, but I believe that is the direction they are going to be moving in. I think within a few months from now, our intelligence community will be reporting to us. I do not know that their doctrines are going to begin changing because of the weakness in conventional forces.

We went through that in Europe for years. We had weaknesses in conventional forces and we relied in my view much too heavily on the early use of nuclear weapons.

So, I see we are going forward, but we may also be going backward.

Could you comment on both of those? How do you think both forward and backward at the same time because I think our adversaries are going to be choosing a different level of competition. I do not consider the Russians necessarily adversarial, but as they move toward more early use doctrine, if they do—and I hope they do not—but it seems to me that is one area we might be able to influence. The terrorist area I do not think we can influence that kind of mind directly. But the Russian part of it I think is subject to some real dialogue with them.

Are we thinking in all of these veins? Admiral, could I ask you to comment and then Andy Marshall?

Admiral OWENS. Senator Nunn, I agree generally with your description of what we face. The issue of terrorism has so many different elements to it. As you said, it is very complex. We do not know exactly which way it is going to go.

We are trying in many ways to address the construct of the way we might be able to react to the different kinds of things that might face us. Clearly, we in the military are not anxious to change dramatically the posse comitatus legislation to allow us to get into the domestic enforcement.

Senator NUNN. Nor am I.

Admiral OWENS. But on the other hand, we may face this around the world, and we want to be as ready as we can.

There are some particular things that are going on that I think are very important and are in this high tech revolution, as well as this other end that you referred to.

Biologic detection is a first order priority for us. We have looked at counter-proliferation around the world, but we have now, of course, been faced with the situation in Japan with the use of a biological weapon. The threat of this kind of thing around the world is of great concern to us because we do not have very good biological detectors. We do not have very good biological point detectors, let alone biological standoff detectors. So, we have placed a lot of emphasis on this issue. A lot of effort in this 1996 budget goes into the priority to develop biological detectors, both standoff and point detectors. That is a very important part I think of this terrorism area.

I also am convinced that surveillance, the kinds of surveillance that may in some small way be a part of the other revolution in military affairs that we talked about, can be very important in urban areas, for example.

Senator NUNN. In other words, the new wave could be applied to the terroristic effort, as well as informational warfare.

Admiral OWENS. Yes, sir, exactly.

So, if a terrorist thinks that there is a much better surveillance system—and it comes in many different ways. We have some wonderful UAVs that are very close to being ready to be operational, the Hunter UAV, the Predator UAV. We have the MAE, the HAE, UAV programs. But some of them may in the future have some ability to help us significantly in urban warfare whether it is in places like Mogadishu or whether it is a terrorist activity that could be in any other city in the world. We might be able to have the kinds of sensors that give us real time, 24-hour-a-day surveillance of an area. It would be nice, if you are a soldier in a street about to go around the corner, if you could look on your laptop computer and see what the UAV sees around the corner or perhaps a mile down the street. So, these kinds of surveillance elements might be very important in some of the kinds of terrorist scenarios we might see in the future.

Finally, there is a lot of exciting stuff that is available to us for that foot soldier who has affected or is attempting to affect a terrorist situation—the automatic sniper capability, for example, the great deterrent you would have if you had an automatic sniper capability that could see a flash of a sniper's bullet, measure the trajectory of that bullet—this is possible for us—and then shoot the sniper immediately. I think that is possible very quickly.

Senator NUNN. It is almost like counter-battery artillery fire, but with snipers.

Admiral OWENS. Just like the TPS–36, 37, sir.

So, that kind of thing could be a great deterrent. If you had a HUMVE with this kind of device on it, it could be a significant element——

Senator NUNN. I know my time has expired. So, I will wrap up.

Have you got a team of people thinking through this low level challenge and how we apply high level technology to deal with low level challenge? Is that an organized type effort?

Admiral OWENS. Yes, sir. There are a couple of organized efforts in this regard. One is an ACTD, an advanced concept technology demonstration, that Larry Lynn is doing that looks at urban warfare. There is a very serious effort that the Army has undertaken and we are directly involved with in the JROC in this area.

Senator NUNN. Thank you very much. Thank you, Mr. Chairman.

Senator SMITH. Thank you, Senator Nunn.

I might just say, Senator Bingaman, that Admiral Owens has a plane to catch and I promised him he would be out by 10:15. So, if you have a question of Admiral Owens—I have one or two—then we could ask a couple of Mr. Marshall.

Admiral, one of the frustrations is that it is so difficult to know what the priorities are in your defense technology plan. We have in this book, the Defense Technology Plan, you look in the index and there are 19 technology area plans and they range anywhere from space vehicles down to clothing and sensors and ground vehicles and so forth. And they are all priorities. That what it says in here anyway.

How do you prioritize the priorities? We are going to have some tough decisions to make and I think Senator Nunn's line of questioning is very critical here. We may have to go backwards on some of this to confront that kind of technology. I just want to be sure that you are updating this and giving us some indication. Prioritize the priorities. Pick the top five in that list.

You have done that in this little pamphlet in a broad way—I will not read them all, but you mention controlling of the use of space; countering the threat of weapons of mass destruction; engaging regional forces in decisive combat; and, maintaining near perfect time knowledge of the enemy as to where it is and then to employ a range of capabilities suitable to actions at the lower end. Those are broad categories.

But again, on these specifics, given the line of questioning of Senator Nunn, and at the same time looking into the future for that type of warfare, adjust these priorities a bit and give us some indication where we should go especially in light of the current budget dilemma.

Admiral OWENS. Well, Senator Smith, as you know, we work closely with the Office of the Secretary of Defense as they put together their S&T programs. We have, I must say, never before been very directly at the four-star level associated with this prioritization and this work. We are now working as a team, and we have been for the last 12 months with Anita Jones, with Paul Kaminski, and with Dr. Deutch in an attempt to tie together our interests from the warfighters and from the CINCs. Each of the CINCs, as you know, submits an integrated priority list. Some of the priorities are technical issues. Some of them are not. But we in the JROC at the four-star level are trying very hard to prioritize what matters most to us in joint warfighting.

Where it comes to closure is in the Chairman's program assessment. I have become convinced, of course, that the budget for us in the Pentagon is enormously important in terms of doing the things that we need to do. Here, because of Goldwater-Nichols, General Shalikashvili is required every year to submit to the Secretary his list of the kinds of things that are necessary to most efficiently conduct joint warfare under the constraints of the National Military Strategy and the National Security Strategy.

There you will find many of the kinds of technologies and the kinds of things that we think are necessary in a limited budget environment to genuinely bring light to our capabilities, many of them associated with the RMA. So, there you will find a discussion of the UAVs, for example, and what they mean for the dominance of the battle space. You will hear some reference to systems of systems.

This paper is a staff paper, however, that goes directly from General Shalikashvili to Secretary Perry, and we do not make it public. It is a set of recommendations to the Secretary but it is quite specific, sir, in the context of these technologies.

Senator SMITH. Let me ask you two brief follow-up questions to your answer. Number one, are the users, the warfighters, sufficiently involved in the process in selecting the technology? And two, does the fiscal year 1996 budget, and indeed the 5-year budget, reflect those priorities as you have described?

Admiral OWENS. The answer is that the user is more involved now than he has ever been, Senator. Twice a year I get the JROC—the five four-stars, myself and the four Vice Chiefs—on an airplane and we fly to Stuttgart where we meet with the CINC and his admirals and generals for 10 hours to talk about where we are going with technologies, where we are going with the issue of dominant battle space awareness, et cetera. We complete that day—now this is with the four-star himself and with his admirals and generals—get back on the airplane and fly off to the next CINC. We go around and visit each of the CINCs twice a year to get their inputs, to have these genuine discussions. So, the warfighter I think has never been more directly involved in the technologies and the directions that I have been trying to bring to discussion in our JROC and then finally to the Chairman's program assessment as they are today.

Senator SMITH. I do not expect you to answer it here in detail, but it would be interesting to have for the record, as you look down this table of contents—in terms of context, number 6 here, clothing, textiles, and food, and then you could go to the other extreme and look at sensors or space vehicles or aerospace propulsion.

Granted, we cannot eliminate battlefield clothing. Of course not, or food. But I think in terms of where we spend the dollars, are we going to be making technological advances in the future in food or clothing in the battlefield that justifies expenditures or increased expenditures or increased research there versus the reaction to what Senator Nunn was talking about, terrorism, or to go to the other extreme out into the futuristic space part of our program? Those are the difficulties that we face here, and I am sure you all do too.

Admiral OWENS. Yes, sir. You do not find clothing or improved food technologies in the Chairman's Program Assessment to the Secretary.

I understand the need for prioritization. We are working quite closely with many of your staff members, and I think that any dialogue we can help on we would certainly be anxious to have.

Senator SMITH. Senator Bingaman, do you have any questions of Admiral Owens?

Senator BINGAMAN. Why do we not go ahead and let Admiral Owens go and I will ask Mr. Marshall a question? I do not want him to miss a plane.

Senator SMITH. Thank you very much, Admiral. I appreciate it.

Senator BINGAMAN. Thank you very much.

Admiral OWENS. Senator, thank you very much.

Senator BINGAMAN. Mr. Marshall, let me just ask you. In some ways I think we have trouble keeping the theory connected to the reality, and one of the problems that I have been struck with in the years I have been here on this committee is the enormous lag time between conceptualization and actually getting it into the field for use. We have all talked about the problems with the procurement system and the other reasons it takes so much longer in the Department of Defense or in Government to get this new technology out and usable than it does in the commercial sector.

Is that a serious issue that we need to be addressing in ways that we have not addressed in the past? It seems to me we could have the greatest theory in the world about a system of systems, and if it takes us as long to put it in place and use it as it has a lot of our weapon systems, we are going to way behind the 8 ball.

Mr. MARSHALL. Well, I think it is a potential problem. I think we are in a situation where we have a significant lead at the moment, and the issue is going to be to keep it and to move in the right direction.

I believe that the most important thing is to find a way to shortcut the normal arrangements so that one can have early tests, exercises with equipment which might not be the full production item, but something put together that could be usefully examined, tested in the field. Although part of the reason is not so much the equipment, but if you have some new concepts of operation, you need some things that will allow you to actually go through the process as you think you ought to be doing it. I see that as perhaps the single most important kind of thing to do.

Senator BINGAMAN. Mr. Chairman, why do I not stop there? I know you have another panel to hear from.

Senator SMITH. Thank you very much, Senator Bingaman.

I just have one further question of Mr. Marshall. Let me ask you if you concur with Admiral Owens with regard to this defense technology plan with the focus on space development in the sense that do you agree with him that the control of space in the area of communication, intelligence, navigation, weather analysis, and so forth is an essential area that we ought to fund in future warfare here in the Congress?

Mr. MARSHALL. Yes, I do very much. Also along that line, I agree that a very promising area is UAVs; if you look back historically I think they have not really come along as rapidly as they might have in the U.S. military, but I think that is a major area for the future, along with space. This whole area of sensors and communications is a central focus of where we want to go.

Senator SMITH. Is the battlefield of the future, 2020, 2030, or even 2050, simply going to be a space battlefield with troops just walking in to pick up the pieces after all of that? Is that your vision? I will put you on the spot here. We will all read about this 50 years later and see if you are right.

Mr. MARSHALL. Well, I do not have at this point I think a clear enough vision that far out. Through appropriate gaming and analysis over the next 3 or 4 or 5 years, I think we have a good chance to really nail that down. I think that we know some of the general directions to go, and clearly these information systems are technologies one can safely invest in. But exactly how it is all going to work out, how things will be put together, we do not fully know.

Senator SMITH. The last question. Is there any possibility that Senator Nunn in his line of questioning may be correct in the sense that we could see an increase in terrorism that would be so terrible that we would have to force ourselves to go back into combating it using all available resources, in essence, pull back from the futuristic concept simply, (a), because the other countries of the world are not up to our technological advancement and, (b), because the terrorism is so bad throughout the world that we have to? Is that a possibility?

Mr. MARSHALL. Well, I think there is a danger that we will see or possibly see a good deal more terrorism. As Admiral Owens said, there looks like there may be some interesting applications of the same set of devices and so on to terrorism and lower levels of conflicts, urban warfare, and so on, and there are people looking at that. My feeling is we have probably got to be prepared to deal with both.

Also along the line that Senator Nunn raised about the Soviets, I think it is really over a year ago when they clearly began to put much more emphasis on nuclear weapons. So, I think that is also a direction that things are going in.

Senator SMITH. Thank you very much, Mr. Marshall. We appreciate your testimony very much.

Dr. Andrew Krepinevich and Dr. Daniel Gouré, please come to the table. Gentlemen, welcome. We appreciate your being here very much. I will just say if you have a complete statement, it will be part of the formal record, and if you could summarize in a few minutes, give us your thoughts, and Senator Bingaman and I will have a few questions. Why do we not start with you, Dr. Krepinevich?

STATEMENT OF DR. ANDREW F. KREPINEVICH, JR., DIRECTOR, DEFENSE BUDGET PROJECT

Dr. KREPINEVICH. Mr. Chairman, I thank you for the opportunity to appear before you and discuss this issue which I believe has major long-term implications for national defense.

To begin, I would like to note that we at the Defense Budget Project have been studying this issue for several years. However, my own work on the topic goes back to 1991 when I began writing DOD's first, and as far as I know, only comprehensive assessment on the military revolution while serving on Mr. Marshall's staff.

You have asked me to address four questions. First, what is our current situation? Second, what is the military revolution? Third, what role might Congress play? And fourth, how well is DOD addressing the military revolution?

To begin, those who must do the planning and investing for our defense are confronted by some good news and some bad news. The good news, of course, is that the danger we face today is far lower than that which we faced during the Cold War. The bad news, however, is that the uncertainty we face is far greater. We do not know what country or coalition might pose the next major challenge to U.S. security, when that challenge might occur, and how it might be manifested.

But if history is any guide, we know that unlike during the Cold War, our greatest prospective challenges lie in the long-term future in the form of resumption of great power competition and the proliferation of weapons of mass destruction and diffusion of advanced military technology, principally to the third world.

Adding to this uncertainty is the likelihood that we are in the early stages of a period of military revolution. A military revolution occurs then the application of new technologies to military systems combines with innovative operational concepts and organizational adaptation to alter fundamentally the character of conflict by producing a discontinuous leap in the combat potential and effectiveness of armed forces.

Military revolutions are not new. They have occurred periodically for centuries, although we have not experienced one recently.

Military revolutions are not just technology. Fully exploited, they typically are characterized by new kinds of military operations and organizations. A classic example of this can be found in the battle of France in 1940. France and Germany both had large numbers of cutting edge military systems, planes, tanks, and radios. But the Germans had identified a way to integrate these new systems in a radically new operational concept, the Blitzkrieg, and they reorganized their military to execute it, creating an entirely new kind of ground-land formation, Panzer Corps. The result is that instead of the 4-year stalemate of World War I, Germany defeated both France and its allies in 6 weeks.

Military revolutions also tend to marginalize the value of some formerly dominant or central military systems, operations, and organizations. Consequently, they typically reward best those military organizations that affect the intellectual breakthroughs, that identify the sunrise systems and new operations of that revolution, and that restructure to exploit them. Interestingly for us, those military organizations that enjoy an early lead in periods of military revolution do not always sustain the lead. Indeed, military revolutions are not especially kind to military organizations, even dominant military organizations, that failed to recognize them and adapt accordingly.

The military revolution that is now emerging, as was noted earlier, is likely rooted in the explosion in information technologies, but since we are in an early part of the period, it is unclear which new systems, operational concepts, and organizations will emerge from this revolution.

This increases the level of uncertainty under which we must plan and invest, which makes your job as the Pentagon's board of directors increasingly difficult. Given that, how might we proceed?

I think we need an investment strategy that hedges against uncertainty, that balances both near and long-term readiness requirements within the resources likely to be available for defense, and encourages the U.S. military to exploit fully the potential for this emerging military revolution.

Among other things, such a strategy would emphasize creating a concept development center outside of DOD to assess the implications of the military revolution. For example, the CDC might assess whether establishing information superiority would become a key characteristic of future conflict. At present, as was noted earlier, we have no simulations that do a good job of modeling information warfare. A CDC might help develop them.

The strategy would also emphasize innovation through experimenting with new military systems, operational concepts, and field formations. This could mean such things as funding radically new surface ship prototypes, for example, along the lines of the arsenal ship concept to include eventual testing of an arsenal ship battle group, and funding an expanded version of the Army's experimental brigade force to evaluate its potential for long-range precision strike missions.

The strategy also would emphasize exploiting the commercial sector's advances in dual-use technologies. It is interesting that the nuclear weapon-ballistic missile revolution of the 1940s and 1950s is somewhat of an anomaly in that it was driven primarily by technological advances made by U.S. Government laboratories. However, earlier military revolutions typically involved heavy exploitation of technology developed in the commercial sector as opposed to in the governmental sector.

I want to emphasize that such a strategy does not have to bust the budget. The investments described above would run under a billion dollars a year, or less than 3 percent of our R&D budget.

How well is DOD doing? Not very well, I am afraid. In a period of military revolution, the Pentagon needs to become not only smaller than its Cold War incarnation but very different as well if it hopes to maintain its current relative advantages in military effectiveness. This is a difficult undertaking, especially for a large organization like the Pentagon that has been remarkably successful in recent years and that is currently the dominant organization of its type. Perhaps it is not surprising then that "business as usual" has dominated innovative thinking.

Evidence of just how difficult effecting change can be is found in the Bottom-Up Review. The Bottom-Up Review will produce a smaller military but not a very different military. Briefly, the Bottom-Up Review assumes away uncertainty rather than hedging against it by relying on a single vision of the future, a single scenario to drive the major portion of the U.S. force structure and defense investments.

The Bottom-Up Review also orients U.S. forces on the most familiar challenges as opposed to the most likely or the most dangerous challenges facing us by focusing on refighting the last war, the Gulf war, more effectively while under-emphasizing what we need to do to prepare ourselves for the very different challenges of the future.

On the positive side, as was noted earlier by Admiral Owens and Mr. Marshall, there are some innovators who are trying to think differently "outside the box," as they say in the Pentagon, about defense planning and budgeting. On balance, however, business as usual dominates.

In conclusion, it is quite possible—and indeed, historically speaking, it is quite likely—that the challenges to U.S. security will be substantially greater 15 years from now than they are today. It also seems likely that the challenges will be significantly different as well.

Fortunately, the U.S. military is well positioned to exploit the potential of the emerging military revolution, but realizing this potential will require restructuring the U.S. military into something very different from its Cold War/Desert Storm predecessors. This will not require more defense dollars, but rather a smarter defense investment strategy.

Congress has a unique opportunity and obligation to promote innovation to actions such as establishing a concept development center and funding aggressive experimentation and the prospective sunrise systems, operations, and organizations of this military revolution. Congress could play a major role in supporting the Defense

Department in restructuring to meet the demands of what will likely be a very different security environment than we now see today.

Again, Mr. Chairman, I thank you for the opportunity to appear before you this morning.

[The prepared statement of Dr. Krepinevich follows:]

PREPARED STATEMENT BY ANDREW F. KREPINEVICH, JR., DIRECTOR, DEFENSE BUDGET PROJECT

It is an honor to address this subcommittee on the military revolution, a phenomenon that promises to produce major, long-term consequences for our national defense. I would like to note that, although we at the Defense Budget Project have been studying the military revolution for 2 years, my work on the issue goes back to 1991, when I began writing DOD's first (and, to my knowledge) only comprehensive assessment of the military revolution while serving on Andrew Marshall's staff.

My testimony centers on the four questions relating to the emerging military revolution that, you posed in your letter of invitation:

- What is the current strategic planning and budgeting environment?
- What is the military revolution?
- How might we take the military revolution into account in shaping our strategic planning and investment options?
- How well is the Defense Department adapting to the phenomenon of a military revolution?

WHAT IS OUR CURRENT SITUATION?

Today, we must make investment decisions under conditions of far greater uncertainty than existed during the Cold War. Then we knew the challenger (the Soviet Union), and the nature of the challenge. Much of our investment merely involved "baselining" ourselves against the Soviets. But how do we craft an investment plan when it is not clear which great power or regional power will pose the next major security challenge? Or when that challenge will occur? Or how that challenger will choose to compete?

The United States is currently in a threat "trough" of sorts. The Geopolitical Revolution has left the United States in far less danger than during the Cold War. Today's Rogue States—such as North Korea, Iran, Iraq, Libya—pale in significance to the challenge once posed by the Soviet Union and its clients. Given the recent Gulf war, it also can be said that major regional conflicts represent the most familiar challenges for the American military.

Unlike during the Cold War, the most dangerous challenges for the United States are not to be found in the near-term, but over the long-term. These challenges are likely to manifest themselves in two forms: first, a revived competition among the Great Powers; and second, a far more virulent strain of Rogue State.

If history is any indicator, the current high level of cooperation among the Great Powers is unlikely to endure. This is not to say that a Great Power competitor to the United States will appear in the near-term, as it did after World War II. Nor might such a competitor, if and when it appears, present a challenge of the same type and magnitude as did the Soviet Union. Both propositions seem extremely improbable. What is far more likely is that, beyond the near-term future, a Great Power competitor will appear.

As for the danger posed by Rogue States, the United States spent some 40 years preparing for the Gulf war. But, as General Colin Powell observed, "Desert Storm was that Cold War battle that didn't come . . ." Yet while the Bottom-Up Review employs a single scenario highly reminiscent of the Gulf war to plan and structure U.S. forces for the next 10–20 years, Rogue States seem to have learned from Iraqi military incompetence. They are not trying to reconstruct the Republican Guard; rather, they are selectively exploiting the growing range of increasingly sophisticated arms available in today's "buyer's" market. The combination of a handful of new military "tools" and different operational concepts could present a very different—and far more potent—Rogue State challenge for U.S. Armed Forces early in the next decade than Iraq posed in 1991.

Given that our objective is to minimize the overall danger to the national security, the U.S. military should be restructured to support a strategy that accords high priority to preventing the emergence of the most dangerous challenges, or at least postponing them, for as long as possible (and, of course, to meeting these challenges successfully if preventive measures fail).

Absent a major change in the international environment, this restructuring will almost certainly occur in an environment of tight defense budgets, especially if we are to make progress on reducing the Federal budget deficit. Given this, and the absence of the kind of immediate threat posed by the Soviet Union during the Cold War, it is difficult to see how we will have significantly more resources for defense than the $1.6 trillion projected by the administration over the next 6 years. Moreover, we can almost certainly gain far more in long-term military effectiveness by restructuring our defense posture and investments away from the Cold War approach that still characterizes much of DOD's planning, than by increasing our defense budgets at the margin.

In short, we need to think "smarter" about defense, not "richer."

WHAT IS THE MILITARY REVOLUTION?

The need to restructure our defense investment portfolio is further substantiated by the strong prospect that a military revolution may be under way. Military revolutions have occurred periodically for centuries. They often are stimulated by significant changes in technology that facilitate a discontinuous leap in military effectiveness over a relatively short period of time, as occurred, for example, between the world wars. They are typically characterized by the rise of new military organizations (e.g., panzer divisions, carrier battlegroups, the Strategic Air Command) which are created to fill new roles and to execute new missions. It should be noted that military revolutions often marginalize traditional systems, missions and organizations long-cherished by the armed forces (e.g., the horse cavalry, the battleship battle line, etc.).

Just as dramatic technological advances in mechanization, radio, and aviation transformed the character of conflict between the world wars, so today we confront a revolution in information technologies. These technologies offer advanced military organizations the potential to locate, identify, and track a far greater number of targets, over a far greater area, and for far longer periods of time, and to engage those targets with far greater precision and discrimination, over far greater distances, than has ever been possible before. Just as the information revolution has led dominant corporations to restructure themselves dramatically to remain competitive, it will require the same of dominant military organizations.

The emerging military revolution will likely favor military systems that, relative to Cold War era systems, tend to:

- be physically smaller;
- rely more heavily on low-observable or stealth technologies;
- rely increasingly on electronic warfare and other passive deception measures;
- increasingly seek protection through greater mobility as opposed to physical protection (e.g., armor, weight);
- be more easily integrated into ever more sophisticated "networks of systems" (or systems architectures);
- rely increasingly on automated actions to gain and maintain information dominance by minimizing the expenditure of time;
- employ non-line-of-sight fires to exploit the advantages derived from having achieved information dominance;
- be designed with "open-ended architectures," enabling them to incorporate quickly improvements in military capabilities, and also allowing them to be readily integrated within a network of weapon and information systems.

The emerging military revolution is further increasing uncertainty for military planners. Indeed, it is somewhat ironic that the United States military, by far the world's most technologically advanced, has perhaps the most to lose from the military revolution. The U.S. Armed Forces benefit enormously, both from their large inventory of advanced "capital stock" (e.g., aircraft, armored vehicles, ships, etc.), and from their unsurpassed expertise in executing the missions underpinning the operational concepts that dominate the current military regime.

But a military revolution could upset this. The Royal Navy's situation in the latter half of the 19th century provides a good analogy. As technology made possible submarines, long-range torpedoes, and steel-hulled ships powered by turbine engines and armed with long-range rifled guns, the Royal Navy had to abandon its wooden ships-of-the-line, armed with short-range cannon and propelled by sail, and undertake a major restructuring effort to insure that Britain would continue to "rule the waves." The transition was necessary, but not easy. Given a choice, the officers and men of the Royal Navy would almost certainly have preferred no military revolution at all. This would have permitted them to retain their large investment in existing ships and their tried-and-true ways of operating.

The technologies driving today's emerging military revolution are primarily information-related. For that reason this revolution is very different from the nuclear weapon-ballistic missile military revolution of the 1940s and 1950s. Then much of the technology supporting that revolution was developed in government-owned weapons laboratories. The superpowers were able to take steps to keep the nuclear genie in the bottle through the non-proliferation regime, and ballistic missile capability from spreading through instruments like the Missile Technology Control Regime.

But the rapid gains in information technologies are not so much the secrets of government labs as they are the products of research and development conducted in the commercial sector. Furthermore, these advances are occurring not only in the United States, but in other countries as well, especially in Japan. This military revolution is similar to many earlier revolutions, where technology developed in the commercial sector was "spun on" to the military (e.g., steam engines, the railroad, telegraph, radio, aviation).[1]

Technology will remain a critical determinant of military effectiveness. However, military advantage may well be increasingly dependent on a competitor's ability to exploit its technology by dominating the processes by which technology is translated quickly into systems, and systems into networks, or systems architectures.[2]

Recent military revolutions also have spawned entirely new kinds of missions, and new military organizations to execute them. The naval revolution in late 19th century led to the submarine strategic blockade (and, of course, to antisubmarine warfare, or ASW), countermine operations, screening the battlefleet from torpedo craft, and "ranged-fire" naval engagements. New military organizations or formations were established to meet the demands of the new environment (e.g., destroyer flotillas; submarine flotillas; ASW organizations, to include convoys; etc.).

Since resources for defense are always limited, military revolutions typically present tough choices concerning investments, roles, missions, and supporting structures. Given the uncertainties involved, there is no single path for exploiting a military revolution. Interestingly, military revolutions most typically favor those military organizations that restructure themselves to operate effectively in a very different conflict environment. Conversely, military revolutions do not necessarily reward those military organizations that invest the most in defense.

Perhaps the "bottom line" with respect to the military revolution is that it is coming along at a difficult time for the U.S. military. Not only does the military revolution add to uncertainty and complicate the defense planning and restructuring process, it also threatens to devalue, at an accelerated pace, the U.S. military's enormous investment (and competitive advantage) in military capital stock and in operational expertise.

HOW MIGHT WE RESPOND?

How should we invest in an era of great uncertainty and declining defense resources? The United States needs an investment strategy that:

- Hedges against uncertainty by building a range of strategic options into the budget that can be exercised, as needed, depending upon how the security environment develops over the long term.
- Balances the need for military preparedness in both the short and the long term with available resources; and
- Encourages the U.S. military to exploit fully the potential of the emerging military revolution to realize dramatic increases in military effectiveness.

What follows is a brief overview of several key elements of such a strategy.

Employ a Range of Scenarios

The Pentagon should consider employing not one, but a range of scenarios in assessing how it might realize its vision of the future. These scenarios should emphasize how the greatest challenges and the most likely challenges could shape the competitive environment, or the "business" of national defense. Equally important, the scenarios should explore how prospective competitors might exploit the emerging military revolution to change the way in which military organizations compete.

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[1] It is important to note that in the 1950s and 1960s many of the early advances in information and communications technology (e.g., computers, satellites) were stimulated by the Defense Department, as were other advanced composite materials that helped make stealth systems possible. In a sense, the U.S. military is now in a position to "spin on" commercial technologies that, in their more primitive form, were "spun off" from, the defense sector to the commercial sector.

[2] This leads to the interesting question of whether the military will not only "spin on" technologies from, the commercial sector, but processes as well. For example, the Defense Department might improve its logistics (and military) effectiveness—perhaps dramatically—by adapting such business processes as "just-in-time" delivery of replacement parts, and "cross docking" to minimize inventories, warehouse and lift requirements, and the need for large—and highly vulnerable—supply dumps in a theater of operations.

It is important to note that scenarios are not intended to predict the future. Rather, properly crafted, they provide a means of examining and challenging conventional wisdom, of testing various options for organizational restructuring, and of acquiring insights, or clues, about which factors will be most important in shaping the future competitive environment.

The BUR posits a single, "canonical" scenario for shaping the U.S. force structure.[3] In periods of dynamic change, this approach can lead to a very unpleasant strategic surprise, especially when the single scenario posits a future that mirrors the past. Can the United States count on future challengers competing like Iraq in 1990?

Engage in Vigorous Experimentation, and Testing and Evaluation

Periods of military revolution often reward those military organizations that are willing to experiment, especially in attempting to exploit rapidly advancing technologies. For example, in the 1920s and 1930s, the U.S. military developed and flight-tested 12 medium and heavy bombers and nearly 70 attack, fighter and trainer aircraft. As missile technology moved ahead rapidly in the late 1940s and in the 1950s, each of the three U.S. military departments had programs under way to exploit it. It would seem that a similar period of experimentation is warranted today to determine the influence the revolution in information technologies will have on the character of conflict, and the U.S. military's future competitiveness in what is likely to be a very different conflict environment.

Fortunately, funding innovation does not have to "bust" the budget. What is often critical is how the funding is being allocated. For example, between the world wars France spent considerable sums on developing an advanced static fortification system, the Maginot Line, even as that form of positional warfare was passing into history. So it is more than a matter of how much the administration is investing in R&D. It also is a matter of how wisely the funds are being invested. Unfortunately, at present it appears that much of the U.S. military's R&D funding is going into its "traditional" businesses. Will the United States be able to sustain a large, ready force structure over the long term, and restructure itself to incorporate the benefits of rapidly advancing technologies? Given current plans, the prospects are not encouraging.

Restructure Capital Stock Investments

During the Cold War the United States faced a major competitor, the Soviet Union, which aggressively attempted to improve upon its "capital stock" inventory of planes, tanks, ships, guns, etc. Change was, for the most part, evolutionary. New capital stock items were typically marginal improvements over earlier models. This is no longer the case. Today the U.S. faces no major military competitor. Furthermore, changes in technology offer the prospect of revolutionary (i.e., discontinuous) increases in military effectiveness.

The current combination of relatively low near-term challenges, rapid technological change, and an uncertain future suggests that the next few years offer a good opportunity to experiment with military systems rather than to invest heavily in replacing our existing defense capital stock with new generations of equipment that offer only marginal improvements in military effectiveness.

Relatively greater emphasis should be given to upgrading and enhancing existing systems, or replacing them with upgraded versions. Rather than investing in serial production runs, new systems might be introduced gradually, sustained at low rates of production. This approach would allow for relatively greater emphasis on experimenting with a broader array of systems—to include their role in prospective new operational concepts and military organizations.

While currently projected funding levels for the overall R&D budget appear adequate, here is a real chance that, if the administration sticks with its plan to maintain a force structure of 1.45 million troops, pressures will build to reduce those budgets further. This is because—due to the difficulty of reducing infrastructure and other overhead elements—the cost of operating and supporting this force structure is likely to exceed current estimates.

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[3] Les Aspin, BUR, pp. 14–15. The BUR actually employs two scenarios, one each for the Korean Peninsula and the Persian Gulf. Yet in both cases the aggressor possesses the same force structure, U.S. forces respond on the same "short notice," with the same force package, and the same four-phased approach to combat operations. Thus there seems to be little or no real difference in the two scenarios. Other planning scenarios are included in the Defense Planning Guidance (DPG). However, the recommendations of the BUR still guide U.S. defense planning and force structure requirements. Despite the crafting of DPG scenarios, there have been no significant modifications made to the BUR force structure.

Rather than cut further into R&D, we may want to consider reducing the size of our force structure, and using the savings to ensure increased emphasis on experimentation and innovation. This involves reducing existing capital stock in the near term to create long-term advantages. Put another way, it involves accepting some increased risk in the near term, when the danger is relatively low, to lower our risks over the long term, when the danger is likely to be substantially greater.

Creating Strategic Options

The Defense Department might profit more by investing a relatively small sum to determine how the military revolution is changing the character of conflict, and how the U.S. military might best adapt to these changes. Toward this end, one might consider the following projects, which could be funded at a total cost of $1 billion per year—or less than 3 percent of the DOD's budget for research and development. The payoff, however, in positioning the U.S. military to maintain its high level of effectiveness over the long term, could be enormous.

- *Create a Concept Development Center:* Establish and support a Concept Development Center (CDC). A CDC, comprising roughly 100 individuals, would seek to replicate that period of the RAND Corporation in the early 1950s when a small group helped facilitate the "intellectual breakthroughs" in operational concepts, and in corresponding military systems and organizations, that provided the foundation for successful U.S. adaptation from World War II to the competition with the Soviet Union and its allies.

The CDC would work closely with the Nation's defense establishment to help reposition the U.S. military for a very different—and highly dynamic—future security environment. The CDC also would reach out to academia and the corporate world in search of new concepts and ideas. Its activities would include supporting efforts to identify how the character of warfare is changing (e.g., the emergence of information warfare), what military operations will prove most effective in the new security environment, and what new measures of effectiveness will emerge to guide the Pentagon as it restructures itself. The CDC would be an alternative source of ideas for the Pentagon, and a watchdog against the dangers of "groupthink" and uncritical acceptance of the "conventional wisdom." Perhaps most important, the CDC would be a catalyst for innovation.

- *Fund Experiments with New Military Organizations:* The last military revolution to affect conventional forces produced a new army organization—the panzer division—and concept of war—the Blitzkrieg. Today the U.S. Army wants to engage in a range of experimental activities designed to identify the panzer division of the next Blitzkrieg. To this end, it is organizing an experimental force (EXFOR)—a brigade-sized unit at Fort Hood, Texas—based on its "Force XXI" concept.

But the EXFOR is not fully funded. Furthermore, even if this funding gap is closed, the EXFOR will not be able to experiment with the Comanche helicopter, the "quarterback" of the Army new field formation. The Army would very much like to pursue a low-rate, slow-rate production of Comanche beyond the two prototypes called for in the administration's budget. The intent would be to field several Comanche operational units in the EXFOR to see if they can help effect a major—rather than a marginal—boost in land force combat effectiveness. The EXFOR should examine how Comanche can be integrated with UAVs and a follow-on ATACMs as part of a deep reconnaissance/deep-strike architecture.

- *Experiment with a Radically Different Class of Surface Combatants:* The explosion in missile technology will likely lead the Navy, over time, to rely more heavily on missile strikes, and relatively less on strikes conducted by air platforms. Navy sources indicate that Tomahawk prices have come down by 50 percent in the last 8 months (from $1.5 million to $750,000 per copy). The Navy also is making progress in reducing the cost of other fielded missiles. The use of missiles for long-range precision strikes, and for other activities (e.g., remotely emplacing mines) can help create more favorable conditions for introducing land forces, and reduce such forces logistics requirements. But if it is to exploit rapidly advancing missile technologies and more favorable coat tradeoffs, the Navy will need to increase its vertical launch tube capacity.

This might be accomplished by modifying existing surface combatants. However, it seems likely that, as the emerging military revolution matures, existing surface combatants will themselves become far more vulnerable to missile attacks at extended ranges. The Navy has put its ship design money principally on the SC–21, an evolutionary ship design. What is needed, in addition to the SC–21 design, is a willingness to examine a new and very different type of surface (or perhaps semi-submersible or submersible) combatant whose defining characteristics are: first, enhanced survivability through improved design (e.g., incorporating low-observable technologies); and second, a great emphasis on vertical launch tubes. The surface combatant is being referred to as an arsenal, or striker ship.

Is the arsenal ship the "aircraft carrier" of this military revolution? The Navy needs to find out. Some preliminary wargaming is being done on the arsenal ship's potential to increase military effectiveness dramatically (much as wargaming in the early 1920s looked at another untested ship, the aircraft carrier). A more detailed and thorough assessment should be undertaken by the Concept Development Center.

- *Integrate Information and Strike Assets by Developing a Joint Unmanned Aerial Vehicle (UAV) Architecture:* Increasingly the services are able to hit targets at extended ranges, if they can move the targeting information quickly enough. Just as the corporate world has realized huge gains in productivity by moving from large, sophisticated platforms (i.e., mainframe computers) to distributed networks (i.e., personal computer architectures), so too might the services; for example, by emphasizing their "mainframes" (e.g., AWACS, JSTARS) less, and supplementing them with distributed networks of UAVs. Such an architecture, or "web," could prove more resilient to damage than a large platform-based architecture (especially since large platforms will operate in fewer numbers). A UAV web might be supplemented in a number of ways to include unattended, remotely emplaced ground sensors.

Given the growing prominence of joint operations, the Joint Staff should oversee a multiservice effort in this area (i.e., the Army would develop a UAV architecture for its EXFOR that would link to an arsenal ship surface action group, that would link to Air Force and Marine Corps formations). The Vice Chairman, Joint Chiefs of Staff (VCJCS), would be the logical oversight, acting through the JROC. His job would be to provide a "building code" for this architecture (which would be linked to the major platforms, including satellites, and to tactical information systems). Within that "building code," the services would construct the subarchitectures that best suit their unique requirements. Again, analytic support should be provided by the CDC. The ultimate aim should be to achieve what Admiral William Owens, the VCJCS, has described as "dominant battlespace awareness." Along these lines, near-term procurement of significant numbers of several types of UAVs for the purposes of architecture testing would be desirable.

- *Extend the Information Revolution to the Soldier on the Ground:* The military revolution needs to be incorporated at the tactical level, especially in ground operations. Just as the Army is attempting to exploit the information revolution to "digitize" the battlefield, the Marine Corps finds itself in a similar situation. While the world is moving toward hand-held GPS systems and cellular telephone communication, the two ground services find they have a lot of catching up to do. In some cases, infantrymen are still employing communications systems based on 40-year old technology.

Some seem to believe that, as the U.S. military becomes increasingly proficient in long-range precision strikes, the role of the infantryman will diminish proportionately. Perhaps. But warfare is a dynamic enterprise, with the enemy trying his utmost to "offset" the U.S. military's advantages. The antidote to U.S. deep strikes may be attempts at dispersion, infiltration, and close-quarters combat. Furthermore, it seems likely that unconventional warfare will remain "manpower intensive." In either case, the ability of U.S. front-line ground forces to acquire and move information quickly (e.g., on their location, the location of the enemy, calls for supporting fires, adjusting fires, etc.) will likely prove critical to success in an environment where the standard for success is decisive victory with minimal casualties.

The Army and Marine Corps need to link individual units into the U.S. information systems architecture. Experimentation with tactical communication systems that exploit the explosion in commercial information technologies need to be undertaken. It can be done within the Army's EXFOR. The Marines have a pilot program that is operating on a shoestring budget out of their Combat Developments Center. As with the UAV architecture, a communications "building code" needs to be established first at the joint level. Then the two ground force services can profitably move forward and extend the information revolution to the infantryman.

It must be emphasized that these investments are not mutually exclusive; i.e., they should not be considered in isolation. Rather, they are linked to combine intellectual support and field innovation to realize a discontinuous leap in military effectiveness.[4]

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[4] For example, for the German military to have developed the Blitzkrieg, they had to invest in, and develop, new systems: planes, tanks, and field radios. But they also had to provide the

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Overall Projected Funding Levels May be Adequate

Periods of military revolution often reward those defense organizations that think "smarter," as opposed to "richer," about defense. The levels of funding for R&D included in administration's current plan may well be adequate to support an effective program of experimentation, with the potential for yielding dramatic advances in military capabilities. To be sure, at $34.3 billion, the proposed fiscal year 1996 R&D budget for defense marks a substantial decline from the level of funding provided in the 1980s, when DOD's R&D budget averaged nearly $41 billion (fiscal year 1996 dollars) annually. Moreover, under current plans R&D funding is projected to fall to about $26.5 billion (fiscal year 1996 dollars) in fiscal year 2001. Nevertheless, these levels of spending may be sufficient to permit DOD to exploit the potential of this military revolution if we are willing to take a significantly slower approach to modernization than we did during the Cold War.

During the Cold War we faced a superpower competitor that was expending enormous resources on R&D, outpacing even our own robust R&D budgets. But today Russian spending on military R&D is only about one-third of what it was before the end of the Cold War, and no other country in the world spends close to what the United States spends on military R&D. Thus, it is not clear that the United States should feel compelled to spend as much on R&D over the next few years as it did during the 1980s.

Far more important than adding more money to planned R&D budgets is making sure DOD's R&D budget reflects the right priorities. Since the end of the Cold War, the priorities within DOD's R&D budget have changed significantly. Some of this change has been positive and appropriate, such as the increased emphasis placed on developing upgrades and modifications of deployed systems, and the reduced emphasis placed on engineering and manufacturing development (EMD)—the stage immediately preceding the production of new weapon systems. These changes make sense. Because improvements in communications, targeting systems and other electronic components are at the cutting edge of military advances today, in many cases upgrades and modifications to existing platforms represent the most cost-effective approach to improving military capabilities. Conversely, there is simply not enough money available to put more than a very select number of new weapon systems into production.

Unfortunately, there has been at least one trend in R&D funding that may not be appropriate. That is the trend in funding for programs in the "advanced development" stage. This is the last stage of development included in the Science and Technology portion of the R&D budget—the stage at which new technologies are moved out of the laboratory for test and evaluation as prototypes. It is at this stage that DOD is most likely to discover those technologies with the greatest potential to improve military capabilities over long term. Unfortunately, funding for programs in advanced development has fallen substantially over the past few years, both in absolute terms and as a share of the R&D budget. Most of this decline is the result of reductions in funding for R&D on national BMD systems, and the movement of TMD programs out of advanced development into the demonstration and validation phase of the R&D process. But even adjusting for this change, the funding level for programs in this category has dropped significantly. Congress should consider any additional cuts in this area very carefully.

HOW WELL ARE WE DOING?

The Pentagon is faced with the challenge of becoming smaller and very different from its Cold War form. In many respects, it has done a remarkable job of becoming smaller. Its success in restructuring itself into something very different is mixed. This should come as no surprise. It is difficult for large, successful organizations to transform themselves, especially when they are in a period of comparative dominance over their prospective competitors.

On the positive side, we see efforts of "Innovators" like Andrew Marshall and Admiral William Owens, who are trying to develop an understanding of how the Defense Department needs to change to maintain its relative level of effectiveness in a period of military revolution.

The idea behind a Concept Development Center is derived from Mr. Marshall. Admiral Owens, through his Joint Requirements Oversight Council, may gain some insight on prospective new mission areas (within the Joint Warfighting Capabilities assessment areas) that will emerge from this military revolution. The Department also has been promoting Advance Concept Technology Demonstrators—ACTDs—to

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intellectual underpinnings for how these systems would be integrated. The same applies for the systems, system architectures, and intellectual supporting structure described here.

identify how certain technologies might help the military solve some pressing operational problems. And the Department is taking steps to realize the benefits of advanced dual-use commercial technologies.

On balance, however, the "Traditionalists" are prevailing. One only has to look at the administration's Bottom-Up Review (BUR) strategic blueprint, and its effect on force structure and budgets, to see that this is so. Briefly stated:

- The BUR employs a single scenario highly reminiscent of the Gulf war to size and structure U.S. forces. This approach assumes away uncertainty, rather than accounting for it. Simply put, we are buying very expensive insurance to hedge against a very unlikely contingency: waging two nearly simultaneous wars similar to the war we fought over 4 years ago, at a time when our prospective future "competition" will almost certainly move in a very different direction.
- Given the absence of a rapidly modernizing competitor, the U.S. military can afford to reduce R&D funding somewhat from its Cold War levels, and take a more measured approach to modernization. If, however, as many suspect, there is a mismatch between the administration's defense program and its budgets, pressure could build to make still deeper cuts in R&D funding. While such an approach might have been appropriate during the Cold War, when the challenge confronting us was immediate, making further sacrifices in long-term investments to satisfy immediate needs is far less justified today.
- In many instances, our "traditional" investments in future military capability are not creating options, but will likely leave us with only one option, despite the enormous uncertainty we face. For example, is there an alternative option to the Air Force's F–22? The Navy's SC–21 (Surface Combatant)? Traditional investing of scarce defense dollars in "big ticket" programs is crowding out investment for developing low-cost options.

CONCLUSION

It is quite possible—indeed, historically speaking, it is quite likely—that the dangers to U.S. security will be substantially greater 15 years from now than they are today. It also seems likely that the dangers to U.S. security will be substantially different, as well.

Fortunately, the U.S. military is better positioned to exploit the potential of the emerging military revolution than any other military organization. But this will require investing to create a U.S. military that will be substantially, if not radically, different from its Cold War/Desert Storm era ancestor. Identifying what that future U.S. military should be and how the Defense Department might transition to it effectively does not require "more defense;" rather, it requires "smarter defense"—it is more a matter of "will" than "wallet." What we need far more than a few extra billion dollars for defense is a very different kind of strategic investment portfolio.

Congress, as the Defense Department's "Board of Directors," has a unique opportunity and obligation to promote innovation. By establishing a Concept Development Center, funding aggressive experimentation in prospective "sunrise systems"—and in promising new kinds of military operations and organizations—Congress could help the Defense Department successfully restructure to meet the demands of what will likely be a very different security environment than exists today.

Senator SMITH. Thank you, sir. Dr. Gouré.

STATEMENT OF DR. DANIEL GOURÉ, DEPUTY DIRECTOR, POLITICAL-MILITARY STUDIES, CENTER FOR STRATEGIC AND INTERNATIONAL STUDIES

Dr. GOURÉ. Mr. Chairman, I wish to thank you and the other members of the subcommittee for the chance to appear here today.

I have been asked to approach the subject of the RMA with a skeptical, even critical eye. Those in the room who know me realize that the role of critic or skeptic is one with which I am not very comfortable or familiar, but I will try my best to play the role that has been assigned.

In the interest of time, let me start with my conclusions. I believe that revolutions in military affairs are possible and we see them historically. Also I believe that we are standing on the threshold of a military revolution of enormous significance for future U.S. national security.

However, having said that, I do believe that the current approach that we have heard about is basically wrong. It errs in its definition of what constitutes a revolution in its formulations of the objectives for this process of revolution and to a certain extent, perhaps even a large extent, in the capabilities that are being emphasized.

Despite what proponents often claim, current thinking about the next revolution is almost exclusively technology focused. It is a technology driven process. It tends to link the RMA with U.S. successes in the Gulf war, the last war. In particular, the RMA is said to rest with the exploitation of information based technologies, many of which first saw operational use in some form during that conflict. Additionally, it is argued by many that we are now in an information age, that business has now gone information heavy, and that military forces must sort of parallel that evolution and convert to being information centered.

Based on these views, there is sort of a consensus brewing, if you will, in the military and DOD on the kind of three areas of focus that Admiral Owens did talk about, that is, dominant battlefield awareness, advanced C4I, and precision strike. However, as they have been described and planned for and worked on now, they tend to focus primarily on enhancing the operational and tactical capabilities of existing forces rather than in fact going out a generation or more as a revolution would warrant.

As I said, I do not believe that the current approach of the RMA is the correct one, and allow me to point out some of the weaknesses.

In many ways it is an effort to ring the last measure of utility from the revolution of the 1920s and 1930s. It is a revolution that we have been pushing since the end of World War I, through World War II, through the Cold War. In many instances, it relies on advances in electronics, lasers, sensors, digital communications to enhance the effectiveness of essentially all platforms, tanks, aircraft, aircraft carriers, and submarines. These platforms in many ways may themselves have reached essentially the limit of their technical and operational exploitability. Aircraft go at about 9 Gs because it turns you, if you put a man in the cockpit, he tends to black out at much more than 9 Gs. A tank is a tank is a tank whether you put Chobham armor on it and give it a 120 millimeter gun versus a 105 millimeter gun regardless of whether there is a direct laser range finder or communications inside of it.

The RMA we are getting is focused on doing better in operation that the United States plus its allies can already do quite well, as we demonstrated in the Gulf. In fact, when you try to experiment, as Andy Marshall talked about, with many of these concepts and many of the devices—I have seen this in many war games and seminars—with most accepted scenarios, players are hard-pressed to find many useful things to do that are more than of marginal value. They struggle to find a way of making real significant use out of many of these capabilities given the limits of strategy of the box, if you will, within which they are put.

So, in a time of extreme budgetary stringency, we must ask the question whether large expenditures, on what are marginal improvements for traditional warfighting means, are the best use of scarce resources. This question is particularly relevant if, for the foreseeable future, we are dealing with threats no greater than Iran, Iraq, or North Korea.

Third point. The proposed RMA does not directly address the problems of lift, logistic, and sustainments that are created by the characteristics of the force we have, which are large, heavy, and complex. You will get some reduction because of going to smart munitions and improved communications, but in the main we still have to move very large, expensive, and cumbersome forces if we want to go to the Middle East or anywhere.

Even if the current conception is fully realized—that is, if in fact this is the revolution we choose to pursue—the United States will still be dependent on a very small number of high value platforms whether it is 20 V–2s, 400 F–22s, 11 aircraft carriers. While improved munitions in C4I can add to the effectiveness of these platforms, as I have said, reliance on a few high value platforms reduces U.S. strategic flexibility and raises the consequence of the loss of even a small number of them.

The current approach does not adequately address the risks involved and reliance on expensive precision systems to perform traditional missions. Such systems are cost effective only if the conflict can be won swiftly. We cannot afford to conduct large scale protracted conflicts relying solely or largely even on precision weapons.

Yet, every campaign scenario for future MRCs that I know of necessitates the expenditure of thousands of precision munitions in a very short period of time just to essentially win the initial battle. This means that if an MRC is not won in 100 hours, the costs and complexity just escalates dramatically.

The current RMA does not adequately address the revolution in military affairs occurring among potential adversaries, many of whom appear to be pursuing their own RMAs in the form of weapons of mass destruction and ballistic missiles. They are also acquiring spaced-based surveillance, real time communications, all the things that in a sense we say are central to our RMA.

In addition, this RMA only is partially applicable to the kind of low intensity, unconventional warfare conflicts that are at least confronting us more openly now whether we are talking terrorism, another Somalia or Bosnia. There is some use for some aspects, some elements of the current technology, but not a lot. There are other technologies which will be more useful for this kind of work which are not being emphasized in the RMA.

There is also no reason to believe that the kind of RMA that we are talking about pursuing is going to work against equals, so-called peer competitors, if they arise. Indeed, the nightmare scenario, if we want to think about it, is we pursue our RMA. Somebody pops up in 10 or 15 years with an equivalent RMA, and we are looking down the throats of another form of what I call MTR or RMA trench warfare with precision artillery instead of old World War I style imprecise artillery.

Continuing down this path of overlaying sort of an information and precision applique to the present force structure does not address the fundamental problems associated with present modes of combined arms warfare. Essentially we have got a force structure that is unaffordable at current budget levels and unsustainable given the downsizing and changing nature of the industrial base. So, if we do not make some fundamental changes in how we do warfare in what we have, we are not going to be able to keep this going much longer even if we have all the information in the world.

Most importantly, the current RMA does not address what I think of as the new strategic problem confronting the United States in the age that we are heading into, that is, for the next 10, 15, or more years. It is technology centered and focused backwards on our prior successes rather than forward to future challenges.

Absent is really a conception of the role of U.S. military power in the 21st century, the kind of peer competitors or other threats that we are likely to face, and as a result, it neither provides a new and potentially dramatic way for the United States to address the problem of projecting power and maintaining U.S. influence in the world, nor imposes on potential adversaries, particularly the peers, the need to change the way they plan to conduct themselves in order to employ military power.

Let me take a minute to talk about where I think there are the elements of a strategic RMA.

C^{4}I

I think that the United States needs to think in terms of global vice operational surveillance. The current concept of the 200 by 200-mile zone of dominant battlefield awareness is simply too small to be useful against anything but another Iraq. That zone sort of fits the KTO, Kuwait theater of operations. We must look to the kind of capabilities in distributed sensors, in smaller light satellites, a number of different things that allow us to be truly globally aware, perhaps not at quite the level of fidelity that Admiral Owens talks about but clearly better than we have been before.

LONG RANGE STRIKE

The proliferation of ballistic missiles and cruise missiles will make forward deployments much more difficult and require suppression of adversary offensive forces prior to the movement forward of ground forces or tactical forces. Long range strike is probably going to have to be done outside the range of adversaries who may be able to see us coming through the use of their overhead assets or assets they acquire from other sources, including commercially.

In a sense strike-like surveillance must become truly global. Therefore, we need to think about new ways of doing strike to include, frankly, long-range, long loiter, high payload UAVs and cruise missiles and also laser systems, laser weapons, airborne and even in fact space-borne. The ability to place the equivalent of 50 pounds of high explosives into a circle the size of a half dollar on any point on the earth in real time is a profoundly revolutionary capability as compared to anything else we have been talking about here. This capability is inherent in directed energy weapons.

Another area, strategic defense and theater defenses. Clearly all the technologies needed for a high confidence defense capability exist. We are already pursuing advanced ground-based defenses. We need to look in the context of the evolution of our technical capability and planning for future deployments toward the development of very robust technologies in strategic and theater defense, and in many cases we may find that those systems that work for global C^4I and surveillance and for long-range strategic strike will also support the kind of theater and intercontinental defense against missiles, cruise missiles, and air-breathing threats.

Nuclear forces. We have gotten into an age in which we are gradually delegitimizing nuclear weapons even as others acquire nuclear weapons. I would suggest we need to look at new designs for nuclear weapons, particularly against hard and deeply buried structures and hostile WMD capabilities. Low yield perhaps, earth penetrating, but we should not ignore that area.

Land combat systems. Very simply you cannot afford to continue with 65-ton tanks. We need to get to lighter weight vehicles, higher performance vehicles. We need to look at things like liquid propellants, electromagnetic launch systems, things which will allow us to fundamentally change the character of armored warfare. We need to look at fiber optic missiles, E–FOGM and those kinds of systems, that can operate perhaps at 100 kilometers, well beyond the direct fire range of current projected armored systems, as the next generation of capabilities.

Mobility and logistics. We are not only going to have to lighten up the force, but we are going to have to move it faster. One of the areas to be looked at as a revolutionary capability is ultra-fast sealift, whether it is water jet technology or even wing-in-ground effect that can move light forces in a few days halfway around the world. That is truly strategic. If the 24th Mech can get to the Middle East in 48 hours, you have a strategically mobile and influencing capability.

And lastly, low intensity conflict. That was brought up a little bit, and I think it is an area which has gotten under-valued, if you will, in the current focus on the RMA. I would look, in fact, to efforts to improve the protection of the individual soldier, better connectivity between forward deployed troops, and distant support forces and more flexible combat systems. The last term is meant to include so-called non-lethal systems, those that can be used in support operations under ambiguous conditions to disable equipment, interdict mobility, interfere with the operation of electronic systems, and neutralize personnel. Counter-sniper systems, for example, which do really involve some fairly sophisticated technology, either acoustic or infrared, are a good example of where we are applying new technology to try to do a very old business of hunting down the sniper.

Let me conclude there, Mr. Chairman, and hold myself open to your questions.

[The prepared statement of Dr. Gouré follows:]

PREPARED STATEMENT BY DR. DANIEL GOURÉ, DEPUTY DIRECTOR, POLITICAL-MILITARY STUDIES, CENTER FOR STRATEGIC AND INTERNATIONAL STUDIES

Mr. Chairman, I wish to thank you and the members of the subcommittee for the privilege of appearing before you today. The subject under discussion is the Revolution in Military Affairs or RMA. The subcommittee has heard from a number of very impressive speakers regarding their conceptions of the RMA and their expectations regarding the effects that pursuit of an RMA will have for U.S. strategy and military capabilities.

My remarks today will address three questions:

- What is an RMA;
- Are the programs being pursued by the Department and the military services under the rubric of the RMA likely to produce a true revolution, and
- What might be gained by pursuit of alternative strategies?

There is currently a widespread debate in the defense community on the subject of a revolution in military practices and capabilities. This debate has received semi-official recognition in the form of a series of RMA task forces intended to assess the potential for innovation in a number of key warfare areas and in the writings of senior military leaders. There are groups pushing information warfare, precision strike architectures and the like, all under the heading of pursuing the RMA.

The debate over the idea of military revolutions has produced a number of clear questions, but few clear answers. Are we entering a new phase in the purposes, nature and conduct of warfare? Are the changes underway or contemplated sufficiently different from the practices of the Cold War era to be termed a revolution? What technologies, operations, organizations and strategies are manifestations of this revolutionary transformation? Which technologies are central to the RMA? How does the United States compare in its capabilities to exploit the proposed revolutionary technologies compared to other advanced countries? And finally, are we on the correct path with respect to procurements, R&D, force development and training to ensure that the U.S. Armed Forces will be at the forefront of this revolution?

If I may be permitted state my conclusions at the start of my presentation, I believe that revolutions in military affairs are possible. Indeed, I believe that we are standing on the threshold of a military revolution of enormous significance for future U.S. national security. However, I also believe that the majority of proponents of the idea of an imminent revolutionary change in warfare are basically wrong. They are mistaken in their definitions of what constitutes a revolution. Their fundamental mistake is to focus on technology first. RMA's are political and strategic in character, not technologically-driven. Change the political and strategic imperatives for planning and a different RMA may result because nations will exploit technologies differently or even choose different technological approaches entirely.

More specifically, they are wrong in their belief that the introduction of precision strike, information warfare, real-time battlefield surveillance constitute the elements of an RMA. As currently defined and pursued, these concepts provide enhancements to traditional warfighting capabilities and serve to extend the life span of systems which were central to our victory in the Gulf war. Insofar as such improvements prove cost-effective they are probably worthwhile. However, taken in their totality current programs do not constitute a revolution. Moreover, in a time of extreme budgetary stringency, we must ask the question whether large expenditures on what are marginal improvements to traditional war waging means are the best use of scarce resources.

Absent from current efforts at fostering a revolution in U.S. military power is a new conception of the role of military power in the 21st century. Such concepts are critical if thoughtful choices are to be made among the wealth of competing technologies and system concepts available to force planners and acquisition executives. Without new concepts we can expect only evolutionary developments in military capabilities along paths of least resistance. Additionally, we may see no dramatic changes in the mobility or sustainability of the forces, two factors which are critical to our ability to employ military power effectively.

I. WHAT IS AN RMA?

It has become an article of faith in the strategy community that a revolution is in the making. Termed variously "The Military-Technical Revolution," "The Revolution in Military Affairs," "Opportunities for Innovation" and the like, they all retain as their central thesis the proposition that some combination of new technology and military organization, coupled to different approaches to the exploitation of these newfound combat capabilities, will produce a significant change in the ability of a nation or nations to engage in hostilities.

What is this Revolution? Some argue that this revolution is marked by the introduction of significant new technologies to war waging, thereby creating a series of successive changes in force structure, tactics and operations, and eventually strategies. This is the equivalent of claiming that if we build "it" the revolution will come. Others assert that changes in organizations, operational concepts and doctrines can produce quantum leaps in war waging effectiveness without the investment in new generations of systems.

At the heart of the argument of RMA proponents is that periodically a new set of technologies and operational concepts arise which, when taken together, fundamentally alter the nature of warfare. Nations that are most successful at comprehending the nature of the technological change and adapting their military strategies and operational concepts to the opportunities that new technologies afford, become—at least for a time—militarily dominant.

Many focus on the inter-war period of the 1920s–1930s as the exemplar of their proponents thesis. In this period military establishments the world over were small and short of resources but nevertheless managed to produce fundamentally new forms of warfare centered on technologies which had first made their appearance in World War I. Out of the inter-war period came the basis of multiple RMAs, the determinative military phenomena of World War II: large-scale mechanized warfare, close air support and interdiction, carrier-based naval operations, multi-division amphibious operations, strategic air bombardment, and strategic submarine warfare. World War II also saw the exploitation or introduction of a wide range of technologies including radar, sonar, jet engines, unguided rockets, cruise and ballistic missiles, precision bombsights, and the atomic bomb.

In the strategic competition leading up to and through World War II, proponents of the RMA see an important lesson: the nation which first understood and exploited an RMA possesses an significant and potentially decisive advantage over its adversaries. They point to the development in the inter-war period of armored-air warfare by the German Wehrmacht and Luftwaffe, the Blitzkneg, and the U.S Navy's experimentation with carrier aviation, long-range submarines and amphibious landings and examples of successful revolutions. It is important, proponents of the RMA argue for a nation to both push forward the frontiers of technology and to innovate in its operational concepts and military organization in pursuit of the next RMA.

II. DEFINING A STRATEGIC RMA

The current view of RMAs is that they occur frequently, are technology-centered and operationally-tactically focused. Proponents are a bit at odds among themselves as to whether or not superior/revolutionary technology is the sine-qua-non of RMAs or whether innovative operational concepts and tactical design can in themselves produce revolutionary effects. Current thinking tends to associate the RMA with the U.S. successes in the Gulf war. In particulars they are associated with the exploitation of information-based technologies, many of which first saw operational use, in some form, during that conflict. Additionally, it is argued that we are now in an "information age" and that military forces must convert to information-based warfare.

Based on the above view, there appears to be a consensus developing that three technology areas constitute the centerpiece for the next RMA: dominant battlefield awareness, advanced C^4I, and precision strike. As described, this revolution would focus primarily on enhancing the operational and tactical capabilities of U.S. forces. For example, proponents often speak of a 200x200 km. box in which the theater CINC has total knowledge. This is a space which, not coincidentally, approximates the Kuwait Theater of Operations.

I believe that this view of the RMA is inadequate to meet this country's strategic needs in the next century. Indeed, as described, there is little that is revolutionary in the RMA. Rather, it is an evolutionary incorporation of relatively mature technologies intended to enhance the performance of traditional means of combat and facilitate existing operational concepts. Perhaps its greatest flaw is that it is not strategic in either its conception or its influence.

What do I mean by a strategic RMA? Simply put, a strategic RMA changes everything. It redefines the nature of power in the international system, the character of future wars, the dominant forms of combat, the critical technologies or capabilities with which battles are conducted, and the industrial base which provides the sinews of war. Equally important, when a strategic RMA occurs, it is clear to those who can appreciate it, that everything has changed. Churchill and Roosevelt knew in May, 1940, that the world would never be the same. Similarly, those who were at the Trinity site on July, 1944 and air superiors in Washington who received the news of the first successful atomic bomb test new that they had entered a new age.

A strategic RMA is a revolutionary change in national security policy and military strategy which drives the search for new ways of waging war providing, in turn, decisive military advantage to the revolutionary power in the event of conflict and significant indirect political leverage in peacetime. A strategic RMA changes not only war but politics, as well. It redefines not only the limits of the use of force in the service of national interest, but the objectives of war. It impacts on military geography, alliances and inter-state relationships, the value of industries, and the role of human capital in strategic affairs. Additionally, it would take another revolution to undo its effects.

The essential feature of a strategic RMA is the application new means and methods of warfare in a way which solves a strategic problem, one that cannot be addressed by traditional means. The nations that fought in the trenches of WW I all sought ways to avoid another protracted stalemate. Germany believed that it had found a solution in the Blitzkrieg, France in the Maginot line and Great Britain in its fleet. However, it is important to note that in the period between the World Wars, France, Germany, Russia and Great Britain all understood and experimented with the technologies and systems which later comprised the Blitzkrieg. Similarly, Germany grasped some of the elements of modern warfare but failed to adequately address others (mechanization of ground forces, strategic aviation).

Why did some nations seem to correctly understand and apply new technologies and operational concepts while others did not? The answer can be found in terms of the combination of the ability of nations and leaders, both military and civilian, to understand the new technologies and how to exploit them and to the ability of those leaders to shape a military instrument to meet the requirements of the broad strategic and political objectives those leader sought to pursue. Bluntly put, nations choose the extent of their participation in an RMA based on their assessment of their strategic situation, their national security strategies and their view of the likelihood and character of future wars.

Britain and France were inadequately prepared for the opening campaigns of World War II not because they did not understand air power or armored warfare, but because they were planning to fight a different kind of war. Neither sought to create a fast-paced, large scale offensive capability because neither sought to impose radical political change by military means. Hence, they chose to pursue only a partial exploitation of the RMA. Germany, on the other hand, sought the change the political structure of Europe. Hence, its approach to the RMA was equally radical. It should be noted, however, that both Germany and Japan were ill-prepared to fight the global conflicts in which they found themselves enmeshed—this despite their early victories—because they had planned on a short war, not a long one.

For the purposes of harnessing future RMAs, the idea of the strategic problem is important. If there is no single, logical or dominant pattern to an RMA, then what provides the guidance for planners and innovators? How should they know what forms of technology to exploit, what forms military organizations should take, what standards of technical or operational performance make sense for new capabilities? Answers to what seem obvious planning questions such as the character of the war to be pursued offensive, defensive, for conquest, to destroy an opposing political system—the nature of the operations to be conducted in support of that war—scale, scope, timing and duration and the targets, and the ROEs for forces all will provide the "design criteria" for the RMA. In the end, the question of note is still why wars are fought? This provides the basis for leaders to direct the exploitation and organization of the technological changes underway toward a desired end.

Strategic RMAs are rare and tend to define an entire age because they represent the military edge of a political-power struggle, often with ideological undertones. Strategic RMAs can overlap, as well. In modern history there have been only three or perhaps four strategic RMAs. They are:

- **The Napoleonic system of warfare.** What was revolutionary about the Napoleonic system was not the technology of war but its very conception, as a struggle by France to overthrow the extant political system in Europe in the service of which the nation in arms was created.
- **The Mechanization of War.** This was a revolution that began during WW I and continued through WW II up to the end of the Cold War. Its chief features was the creation of capabilities for continental/oceanic scale warfare based not only on mobile means of combat, but on a massive, moving logistics system that supported battlefields thousands of miles in depth and breadth. The measure of a nation's power became its productive capacity measured in such terms as millions of tons of steel, and the inventiveness of its scientists and engineers.
- **The Nuclear Revolution.** No one can argue with the fact that the advent of nuclear weapons constituted a political and strategic revolution. While conventional military power continued to be relevant to nations large and small, nuclear weapons conferred on their possessors, particularly the five acknowledged nuclear states a unique status in the world. A whole military culture and operational milieu grew up around nuclear forces and operational concepts for their use. The presence of nuclear weapons established a new context in the relationship between adversary states. Nuclear weapons determined that the fifty year long confrontation between the West and the Soviet bloc was a Cold War and not a hot one.

- **Strategic Defenses.** One can take issue with the statement that strategic defenses or SDI constituted a strategic RMA. Certainly, it is at best an incomplete revolution. Nevertheless, SDI possessed the attributes of a strategic RMA. It was based on solving a strategic problem, vulnerability of the states to strategic nuclear attack. Had it been successful, SDI would have changed the nuclear equation, fundamentally undercutting Soviet military power and the place of the U.S.S.R. as a superpower. Technologically, it demanded as host of new technologies. Operationally, it offered the prospect for innovative ways of addressing the problem of offense and defense. Like the revolutions of mechanized warfare and nuclear weapons it suggested changes in the measures of national power from tanks and warheads to DRAMs, pixels, and baud rates.

It is with this sense of the strategic basis of past revolutions in mind that I come to the conclusion that those who see the RMA as the realization of the potential of systems and capabilities demonstrated in Desert Storm are wrong. Desert Storm was not beginning of the new but the end of the old. Specifically, it denotes the end both of the era of confrontation between East and West, the Cold War. More important, it signals the beginning of the end of the age of mechanized conventional combat which began in the 1920s.

III. INFORMATION DOMINANCE AND PRECISION STRIKE ARE NOT A REVOLUTION

I do believe that the elements of an RMA, as I define it, are present. Having said that, I also believe that the current approaches to the RMA being advocated in DOD, by senior military officials, and by many defense experts are neither revolutionary nor likely to produce the operational results promised for them. Indeed, while the power of individual platforms may be increased through exploitation of new technologies, that of the force as a whole and of the United States as a global power may actually decline if these measures alone are implemented. Moreover, it is based on a conception of warfare which does not fit with the era we are entering and hence will not provide the kinds of strategically useful military power this country will require in the 21st century.

What passes for an RMA is really an effort to wring the last full measure of effectiveness out of the existing force posture. In a sense, it is a continuation of the revolution of the 1920s and 1930s. We were successful in that revolution, the Gulf war was evidence of that. This was no mean feat. However, the era which began in the aftermath of WW I and ended with the collapse of the Soviet Union and the defeat of Saddam Hussein is over.

What is this supposed modern Revolution? It consists of a number of interlocking parts intended to provide extremely lethal firepower at a variety of ranges with a short firing cycle (time, distance, weight). The pieces are:

— Rapid/near-real-time surveillance and targeting and dissemination of that information to all command echelons;
— Precision fires;
— Continuous operations;
— Holding at risk full range of enemy targets including those that are mobile, hardened, buried, to the depth of the theater—so long as the theater is not much bigger than Iraq/Iran or North Korea.

The origins of the current "Revolution" are well known. The "revolution" began with the post-Vietnam era effort to deal with the problem of the European theater, specifically, to provide a credible defense forward against a numerically superior foe while avoiding for as long as possible the resort to nuclear weapons. Its purpose was to address the problem posed by continental warfare in the nuclear age. It grew up in the context of one world and one military-strategic situation and now it is being argued that it is the right answer to another situation.

In many cases we are witnessing efforts to achieve goals for military forces that have been pursued since the 1930s. Precision strike and the concepts of victory through strategic bombardment are almost as old as air power itself, and almost as hard to achieve in practice today as in WW II. Using a combination of smart and dumb bombs the Allied Air Forces did about as much damage proportionately to Iraqi infrastructure and military capabilities in a month as the Eight Air Force and Bomber Command did to Germany in 2½ years. Yet Saddam both survived and is rebuilding. The dream of air power theorists has yet to be demonstrated; better information and more precise ordinance are not likely to make their case unassailable.

In other cases, we are relying on advances in electronics, lasers, sensors and digital communications to enhance the effectiveness of basic systems (tanks, aircraft, ships, submarines) to extend the capabilities of platforms that have, in large measure reached the end of their technological and possibly operational exploitability. Let me point to a few examples:

- **The tank.** The M1A2 will be an improvement over the M1A1 or previous generations. Nevertheless, the platform itself, the main battle tank, has reached the end of its technological evolution. It is about as large as it can be, goes about as fast, and carries about the largest gun feasible. It is too heavy to transport readily, runs out of gas and can't carry enough munitions.
- **The tactical fighter.** Like the tank, the tactical fighter is reaching the end of its potential in terms of speed, carrying capacity, size and range. The human body cannot stand more than about 9 Gs. Stealth adds to the penetration capability and engagement potential of the fighter but at costs, both in dollars and in other functions such as the ability to carry exposed ordinance and other equipment.

While the M1A2, F–22, Comanche helicopter, V–22, and *Seawolf* submarine will undoubtedly prove tactically superior to their predecessors, they offer only a marginal improvement in operational utility and no prospect for altering the ways in which the United States will project military power or fight its wars. Moreover, because our conception of warfare are unchanged, these capabilities, coupled to the requirement that regional conflicts be brief in duration but of high intensity creates a requirement for mobility and sustainability which is enormously expensive to maintain and strategically quite inflexible. While improved intelligence and smart weapons will reduce somewhat the total weight of forces and supplies that must be transported, overall, the problems of lift and sustainment will remain as daunting for the military of 2010 as it is today.

More important, continuation down this path of overlaying an information appliqued to the present force structure does not address the fundamental problems associated with the present mode of warfare: it is unaffordable at current budget levels, unsustainable given the downsizing and changing nature of the industrial base, and insufficiently mobile and agile to meet the range of challenges we will face in the future.

There are many who argue that the above description is an incomplete characterization of the new revolution. They assert that information warfare and information dominance are the centerpieces of the new revolution. After all, they argue, information management and movement are at the core of the economies of the post-industrial states. Moreover, every few years information technology is making quantum jumps in efficiencies and accessibility.

There is a surface plausibility to this when one looks at the civil sector. The explosion of media, the computer revolution, cellular telephones, Internet, and shortly, Iridium, and the like. Access to information is viewed as key to modern economies. Indeed, the growth of the service sector of advanced industrial nations, the creation of post-industrial economies, is cited as evidence of a revolution in commercial-social relations with import for military affairs. Advocates of information-based warfare also point to the alleged de-layering of industry due to information as portending the same shift for the military.

In some respects, this so-called revolution is even older than its advocates suggest. Many of its elements date back to the Second World War. One can argue that the British invented basic information warfare. The Battle of Britain was won as a result of Britain's superior information (radar) and control (Fighter Command). Even deception and information management were part of Allied efforts. Remember Ultra and the bodyguard of lies? We have progressed well beyond this stage, qualitatively. Modern means of information warfare (e.g., computer viruses, false data, jamming, etc.) do represent a significant qualitative advance over that which both allies and axis employed from 1939 to 1945. But in conception the operations themselves have changed very little.

World War II also points out the limits of information dominance. Stalin was well-warned of Hitler's invasion plans but chose to ignore them. The U.S. military in the Pacific was forewarned by Washington of potential Japanese aggression but misunderstood or misinterpreted the warnings. Eliot Cohen and John Gooch have documented a number of cases in which information was present but decisionmakers chose to act in ways contrary to the true facts. There is a presumption that more data means more knowledge, more knowledge leads to better understanding, and understanding will serve as the basis for better decisionmaking. In a perfect world, yes. Reality often gets in the way of perfection. The process of combat dominates the flow of information, not the other way around.

More important, still, information is only one component of a war waging or combat capability. Even with precise information, it is necessary to strike and destroy the target. When targets number in the thousands, the cost of striking them becomes high. The effort to attack thousands of precisely located and tracked targets is compounded by those of supporting and sustaining both the information and strike systems employed.

This leads to a more fundamental question: is the current "cult of the offensive" with its focus on high attrition as the dominant warfighting mechanism appropriate to the modern world? Is this approach to combat necessary for the types of wars we intend to fight over the next 10–20 years? Even if the answers to these two questions is yes, how we do it must be very different in the future. Destruction of field forces may be less important than before.

In fact, the revolution described above, with or without its information component, is at best one that is over; it has already exerted its revolutionary impact on the world and on military organizations. It was at least 20 years in the making—measured from the first use of autonomous sensors and smart munitions in Vietnam up to the Gulf war. But it is over.

In truth, this RMA, while useful, does not constitute a fundamental change, a true revolution. As noted above, it is working a known and largely solved problem. While it is quite true that doing another Desert Storm would be more difficult in the future, as budgets and force structures continue to shrink, that is not a sufficient basis for a Revolution. What is missing from the equation is a new strategic problem. Advocates of the precision/information/C^3 revolution are claiming that they can do better—and perhaps cheaper—an operation that the United States (plus allies) can already do. Indeed, so long as the challenge proposed by these revolutionaries is one of winning limited theater campaigns against second or third tier adversaries, there is likely to be little enthusiasm for this new revolution. Moreover, so long as it is a known and scoped problem that is being worked, there will be little impetus for making the kinds of radical organizational and operational changes proposed by the innovation advocates.

Desert Storm tells us as much about the inherent limitations of this revolution as it does about its successes. What could be achieved on the limited scale of the KTO/Iraq, by the application of 50 to 60 percent of the total military power of the United States, would have been unsuccessful in Europe, against the WTO. Even in the Gulf the effort required was tremendous. Campaign analyses of the all-conventional battlefield of the future, employing large amounts of precision munitions, information warfare, nonlethal technologies, etc. suggest that the costs will be extremely high and grow over time.

Many of these systems depend on the adversary being of a certain character and, fighting in a certain way; if they do not, we may find that even at the level of the MRC we are in trouble. This RMA also fails to adequately address the revolution in information denial which is taking place: camouflage, unbreakable codes, fiber optic communications, laser countermeasures, etc. These will act to limit the effectiveness of much of the revolution as it is seen to date.

Thus, there is something highly mechanistic about the current approach to the RMA. There is no, sense of the dynamic, of warfare as politics or art form with highly changeable features. There is a tendency to view potential adversaries as caricatures either of ourselves or of the former Soviet Union—so-called peer competitors—or of Iraq. Opponents do not learn, they do not exploit technological or strategic opportunities; at best they may gage in "niche warfare" via terrorism or nuclear blackmail.

Similarly, the concept of war under the banner of this RMA resembles a shooting gallery, a set piece battle in which superior U.S. firepower is concentrated on a relatively defenseless opponent. The objective, similar to that in the Gulf, is simply to win the firefight, to break the enemy force, leading to a return, more or less, to the status-quo-ante. What is significant in this conception is the ability of the United States to solve the problem of insufficient killing power—thereby obviating the need for operational art, maneuver, and even strategy. This is accomplished by relentless air strikes against a supposedly defenseless and relatively immobile opponent. Under these conditions, given adequate intelligence and targeting, the problem of modern war is reduced to one of logistics, the ability to maintain adequate flows of weapons and fuel.

In summation, the precision/information/C^3 construct does not meet the tests for a true RMA. It fails for a number of reasons:

— It is, in fact, not a revolution, but an effort to wring the last measure of utility from the revolution of the 1920s and 1930s. It uses advances in electronics and information systems to maintain the viability of operations and platforms that have remained, relatively unchanged, for nearly 50 years.

— While enhancing the performance of tanks, aircraft, and ships, it does not change the way the United States has conducted war in any fundamental way. We still envision war to be a process perhaps swifter than in the past but still dominated by large-scale combined arms conflict. As Desert Storm showed, such wars are dominated not by information, precision strike, or stealth, but in the end by numbers, by logistics. And in logistics and support we are still subject to the old problem of ton/miles. It also does not address the problems of the growing cost and operational inflexibility of a large, heavy and complex force posture designed for continental war against the Soviet Union. Finally, it fails to address the erosion of the defense industrial base which is critical to the production of the platforms which will house and employ the new information systems.

— It does not adequately address the "Revolution in Military Affairs" occurring among potential adversaries, specifically their access not only to weapons of mass destruction and ballistic missiles but to a broad range of capabilities including space-based surveillance and communications, modern cruise missiles, advanced diesel submarines, and modern combat aircraft.

— It does not recognize the risks involved in reliance on expensive precision systems to perform traditional missions. Such systems are cost-effective only if the conflict can be won swiftly. We cannot afford to conduct large-scale protracted conflicts relying solely on precision weapons. Yet, every campaign scenario for future MRCs necessitates the expenditure of thousands of precision munitions. This means that if an MRC is not won in 100 hours, costs begin to escalate dramatically.

— There is no reason to believe that it can work against equals, so-called peer competitors, if they arise. A peer competitor will possess the resources, material and technology to counter an MRC-based strategy and force posture. It will have the advantage of interior lines of communication and proximity to the battlefield whereas the United States will have to project its power. In particular, a peer competitor will not be defeatable in the kind of temporally and geographically limited campaign currently the focus of RMA planning. Unless the United States has taken the necessary actions in peacetime, a peer competitor can be expected to contest the United States for control of space, the air and ocean approaches to his territory and the beaches and airheads. Finally, the focus on the current RMA concept on information technologies, particularly at the theater level creates vulnerabilities, that can be exploited by a talented foe.

— And, most important, it does not address the new strategic problem confronting the United States in the new age. Indeed, as defined, this RMA neither provides new and potentially dramatic ways for the United States to address the problem of projecting power and maintaining U.S. influence in the world nor imposes on potential adversaries the need to change the way they conduct themselves in order to employ military power.

V. THE ELEMENTS OF A STRATEGIC RMA FOR THE 21st CENTURY

A. Strategic Concepts for a New RMA

As I stated in the beginning of my remarks I do believe that the basis for an strategic RMA exists. A new strategic RMA can be built around three concepts. First, the world is in a state or profound change. Unlike some, I do not believe that the key feature of this change is a breakdown of order and the rise of chaos. Instead, I believe that we are entering a period in which a new constellation of great powers will emerge. The national security policies which these powers will pursue and the manner in which they choose to relate to one another and to the lesser states will decide the character of the international system in the coming decades. Nevertheless, the international system is evolving and, therefore, we will face threats both more advanced and more capable, numerically and in resources, than confronts us at present. This includes future great powers capable of posing a direct threat to the U.S. homeland.

Clearly, a great power conflict is not imminent. It may even be avoidable. Insuring against such a conflict means deploying capabilities which discourage a potential rival from resorting to military force to enforce its interests, pose a threat of strategic vice operational defeat to include the seizure of his territory, and deny the adversary any credible option to escalate.

The United States will require military power that will help it shape that future environment, deny an adversary the ability to deter our involvements abroad through threats to our force's, allies or homeland, and meet the challenge, should it arise, of defeating a peer competitor. This presents the requirement, in general, for military capabilities that are adequate to deter, and if necessary, fight other great powers. For the United States, this means military capabilities that can project and sustain U.S. influence at great distances, support and defend critical allies in zones of close contact to potential adversary powers, conduct decisive and highly lethal combat operations rapidly, and deny the adversary the ability to project military power outside his own borders.

Second, the nature of military capabilities and systems are becoming self-evidently inadequate to the demands that are being placed on them now, much less the demands of the future. Nations can no longer afford to maintain standing forces based on contemporary technologies that are both large and highly ready. The expense of enhancing the performance of traditional means of warfare are limiting the ability to acquire such systems in adequate numbers. As a result, the industrial base which produces those capabilities continues to shrink to the point that it will have difficulty sustaining a peacetime modernization program and be incapable of rapid expansion should a greater-than-expected threat emerge.

For the future, the United States will require forces that are flexible, can be projected at long-ranges rapidly, and make the United States a desirable, even necessary ally to others. Such forces will need to be relatively non-intrusive in peacetime, and acquirable even in relatively large numbers, without the risk of remilitarization of our economy or polity.

Third, there are new technologies available that can provide the means to pursue a strategic RMA. These capabilities can be exploited to do much more than simply establish a capability to dominate the battlefield. They can, if pursued assiduously, provide the United States the ability to be a global power, to deploy decisive military power anywhere on the face of the earth, to control space and the seas, and to protect the U.S. homeland, allies and deployed forces from attack.

What is currently being developed in advanced military capabilities does not sufficiently exploit the revolutionary potential of technology because it is focused on Desert Storm *redux*. It focuses on current adversaries, those that are geographically, economically, and technologically known quantities and fundamentally weak adversaries. It provides no schema for addressing adversaries of greater size or sophistication nor an approach to conflicts of large scale or high intensity.

In the future, the United States will have to contend with the rise of other great powers. Our major potential rivals and adversaries (PRC, Russia, India) are all continental powers. At present, they pose no serious military challenge to the United States. One goal of a strategic RMA is to create U.S. military capabilities which simultaneously devalue the present and expected military capabilities of these powers, should they seek to challenge the United States with force, and make it more difficult for them to pursue a strategic RMA against the United States.

Future great powers will pose a significant set of problems for future military planners. In most cases they are going to be difficult to reach from the sea. They have the advantage of local presence, on the ground superiority, large populations and land masses. They may not be precise economic or technological peers, but will have reasonably good militaries and even quite a lot of advanced technology, much of it dual-use.

In the context of future great power rivalries, the United States will require forces which will make it a relevant and desirable ally, and the capabilities for significant unilateral interventions at great distances, even for protracted periods. Advanced technology should be directed to providing the United States with the capacity to: provide the high-power killing capability to buttress allied forward defenses; "hold-at-risk" hostile conventional forces moving across national borders; deny homeland sanctuaries; enable movement from offshore and CONUS onto the Eurasian continent, and; to protect our own and allied forces.

While the problem of a so-called peer competitor may be in the future, that of a regional adversary is with us today. Advanced military technology have been a measure of national power for nations emerging from second or third-class status. Third World nations repeatedly bought advanced technologies from the major powers as symbols of their own desire for or anticipation of local or global greatness. Where once it was the battleship, it has now become the high-performance aircraft and the submarine, the ballistic missile, satellite surveillance system and WMD.

A new strategic RMA will be needed not only to meet the challenge of the future major potential adversary but to deny regional adversaries the option of contesting for local superiority. The technologies of the Gulf war are, to a large extent, no longer the sole possessions of the advanced powers. When a North Korea can produce nuclear arms and intermediate-range ballistic missiles, the line between advanced and smaller powers is appreciably narrowed. While operational and organization advantages can still provide the great powers with combat superiority, this does not translate into political advantage in the way that absolute technological, numerical and/or positional superiority once did. It is no longer sufficient to steam a battleship squadron off the coast of a Third World country in order to ensure local superiority.

The measure of military advantage and its ready transferability to the political arena is changing. Rocket science, software engineers and biochemists are proliferating around the world. Building rockets is no longer "rocket science." Thus, what it now takes to "overawe" an Iraq, Iran, India or North Korea is more than most countries can deploy. Changing the calculus of power for these states means demonstrating that their existing military capabilities are irrelevant when placed in juxtaposition to those of the United States and that their prospects for equalizing the balance by "niche" investments or numerical superiority are nonexistent.

B. Operation Concepts for a New RMA

To address a future in which the United States must project power into multiple theaters and against a range of possible adversaries requires strategic maneuverability. Strategic maneuverability means the ability to deploy U.S. military capabilities in such a manner as to place decisive force in the battle zone rapidly and in a manner which exploits weaknesses in the adversary's deployments and concentrates U.S. strength. This will mean deploying U.S. forces in different places around the world, advancing from several directions simultaneously and from long ranges.

The essence of strategic maneuverability is also to create opportunities to exploit U.S. advantages in surveillance and targeting, long-range strike, and strategic defense. In essence, this means a replacement of traditional concepts of maneuver warfare, based on large and heavy ground forces as the decisive striking force, with the idea of maneuver by fire for both strategic and operational combat.

Strategic maneuverability also means deploying the forces most appropriate for a given situation. The United States will require the flexibility to deploy different types of power to different theaters. In Europe ground forces may be particularly important. In the Middle East a combination of ground and air power could be most advantageous. In the Far East air and naval power would probably dominate. Overarching these would be strategic capabilities for global surveillance and targeting, long-range strike and rapid, mobile logistics which would be applicable to any theater.

Strategic maneuverability must inevitably place a premium on long-range strike and global defenses. Indirect fire, particularly long-range, will become the main instrument at the operational level of war. Land forces will evolve in the direction of greater emphasis on defensive capabilities. These land capabilities could serve to fix opposing forces in locations in which they can be destroyed by long-range strikes. In essence, ground forces become the anvil and long-range strike the hammer.

The immediate problem for the United States in exercising strategic influence in distant places is getting there and staying there. It took 3 or more years for the United States to get into Europe in sufficient numbers and with sufficient logistics and infrastructure to be able to launch the assault on Nazi Germany. Do we take 3 or more years the next time? Even so small a conflict as the Gulf war took more than 6 months of uninterrupted preparation. Getting there, as in strike delivery, overflight, loiter, interdiction of hostile LOCS and SLOCs would produce a different set of requirements than those for regional conflicts with relatively unimpeded access to hostile territory from air, sea and/or land. This is even more true if the opponent exercises a denial strategy, perhaps even a delaying strategy, with respect to the movement of U.S. forces and supplies overseas.

Deploying force, not to say forces, into the heartland of Europe, or on the mainland of Asia will be a different game than that we have ever before played. Sustaining that force will be equally difficult. The current and anticipated set of capabilities do little to reduce the difficulty, complexity, weight and vulnerability of forces deployed forward or moving in that direction. Large supply depots and complex echelonment means large and vulnerable rear areas' to be targeted by the opponent. The current organizational approach to fighting forward will have to be rethought from the ground up (literally and figuratively) if we are to be able to engage in large-scale combat in Eurasia in the 21st century.

The need to deploy U.S. power rapidly and to long ranges, and to defend against attack place a premium on control of critical environments, specifically space and the seas. Space provides the opportunity to maintain global C^4I capabilities. It also ensures that the United States can deploy systems for global surveillance and targeting. Space also provides a unique vantage for the conduct of strategic and theater defense operations against a wide range of threats. It will be important to deny space to an adversary. This means, first, the ability to transit space for offensive purposes. It also means the use of space-based assets for surveillance and targeting, communications and navigation.

The ability to integrate, command, and direct friendly forces is critical to the ability to operate in coalitions as well as to attract and keep allies. Interoperability must be one of the operational objectives for U.S. defense planning. The United States needs to design within its force packages capabilities that can rapidly and decisively augment the local power of allies and coalition partners, thereby providing the decisive edge that lets allies take the greatest possible responsibility for their own defense.

There will always be a requirement to address lower-intensity conflicts, peacekeeping operations and other special cases, the so-called operations other than war. But these are not the focus for development of capabilities to support a strategic RMA. Such forces can benefit from some of the developments directed toward the strategic problem, particularly those in surveillance, communications, logistics and lift.

C. Technological Concepts for a Strategic RMA

The capabilities we are emphasizing today relate to the high-intensity, attrition-imposing, Desert Storm type of conflict. For this kind of war munitions are more important than platforms, and information more important than manpower on the ground. For the next "big" war, these capabilities may be less interesting than those that enable us to penetrate air space, deny access to space and the seas, destroy mobile strategic targets and hardened facilities and deny critical communications.

- **C^{4}I.** The United States will require *global vice operational* surveillance, targeting and communications. The current concept of 200x200 km. zones of dominant battlefield awareness is simply too small to be useful against anything but another Iraq. The focus on battlefield awareness also emphasizes capabilities which, while appropriate to the prevailing notions of the scale of future conflicts, would not be adequate in terms of range or basing structure to support a flexible, global strategic RMA.

A combination of technologies are in development that would substantially address the C^{4}I requirements of a new strategic RMA. A variety of defense and commercial satellite programs such as Brilliant Eyes and Iridium would provide the basis for a distributed—hence survivable—global surveillance/targeting and communications capability.

- **Long-range strike.** The character of strategic striking power needs to be changed. Until now it has depended on the movement forward into the theater of war of enormous amounts of material and manpower. The proliferation of ballistic and cruise missiles will make forward deployments more difficult and require suppression of adversary offensive forces prior to any such movements. Long-range strike will have to be conducted from outside range of adversary, possibly placing U.S. forces far at the seas and away from current overseas basing structures. In many cases, long range strike would have to originate from the United States. Long-range strike would have to address both theater level and strategic targets ranging from hostile combat platforms to strategic assets and political/military/economic infrastructure. Strike, like surveillance and targeting, must become truly global.

Technology needs to be brought to bear to offset the traditional costs of long-range strike: distance, time and weight or mass. The problem with relying on aviation assets are several. Tactical aircraft need to deploy forward and carry with them a large logistics and support network. Long-range air-breathing platforms provide insufficient coverage of the battle space over time, particularly for addressing mobile or fleeting targets. Ballistic missiles, while relatively swift and long-range are inefficient means for delivering conventional ordinance in all but very special instances and are limited by treaty. In addition, the requirement to penetrate hostile airspace raises the cost of long-range strike by requiring the use either of stealth or of a large number of support platforms (SEAD, EW, etc.) in order to assure mission success.

A number of technologies exist which, if successfully exploited hold out the prospect for enhancing U.S. capabilities for long-range strike. Among the technologies worth pursuing are those for high power small bomb, hypervelocity endoatmospheric missiles, and UAVs. The first two would both expand the payload and the range of current and planned air-breathing platforms. Long-range, long-loiter, high payload UAVs and cruise missiles need to be pursued as part of the solution to the long-range strike requirement.

A critical technology area for exploitation must be directed energy weapons. The ability to place the equivalent of 50 pounds of high explosives into a circle the size of a half dollar on any point on earth in real time is a profoundly revolutionary one. This capability is inherent in directed energy weapons. A directed energy weapons capability would address the three principal problems associated with long-range strike: distance, time and weight.

- **Strategic and theater defenses.** The evolution of the threat means that there will be a greater need to provide high confidence protection of the U.S. homeland—as well as allies and deployed forces—from attack by both ballistic and air-breathing threats. Defenses need to be sufficient to address small attacks from any source. A growth potential to a capability to defend against large attacks needs to be included in the basic design for strategic defenses.

Virtually all the technologies for a high confidence defensive capability exist. Advanced ground-based theater defenses are currently in development. The research on national military defense under the SDI program provided the basis for a robust national missile defense. These capabilities, embodied in the Air Force's SBIR and Brilliant Eyes programs, and in research into space-based directed energy and kinetic weapons can support not only missile defense, but air defense, space defense, and space strike.

- **Nuclear forces.** The current focus on all-conventional conflict has led to a progressive delegitimation of the role of nuclear weapons in U.S. strategy. It is ironic that while the United States has moved strongly away from reliance on nuclear weapons, even to deter, the threat of nuclear weapons in the theater, potential near term adversaries such as North Korea, Iraq and Iran are pursuing their own nuclear revolution in military affairs.

The United States requires a nuclear arsenal which, while perhaps smaller than today, is more flexible. In particular, we need to develop special nuclear capabilities to deal with target sets such as hardened and deeply buried structures and hostile WMD capabilities. Work needs to be done to provide a capability for very low-yield weapons and on earth-penetrating devices.

- **Land combat systems.** Traditionally, heavy land combat forces have been the decisive arm of most large militaries. However, as noted above, the era of heavy ground forces is coming to an end. Indirect fire and long-range strike seems poised to replace maneuver and shock as the decisive elements of land warfare.

To be effective and deployable in the next century, land combat forces need to be tailored for defense, exploitation and pursuit. Ground forces would themselves shift to greater emphasis on indirect fire systems and to a reduction in the role of armored fighting vehicles.

A number of technologies hold promise in this area. For example, liquid propellants (LP) would radically alter the character of armored forces and artillery. LP would allow the development of lighter, smaller yet extremely lethal armored gun systems capable of carrying many times the ammunition carried by modern tanks. Electromagnetic launch systems could provide similar capabilities for lighter, smaller gun platforms. Similarly, fiber optics guided missiles such as the current E–FOGM would provide anti-tank strike and air defense capabilities that could be carried on light and highly mobile vehicles.

- **Mobility/logistics/sustainment.** This is one of the most critical areas for future U.S. strategic power. Yet, it is not subject to the same revolutionary efforts as are evident in information systems or precision strike. While improvements in targeting and strike will somewhat reduce mobility requirements, in the main, so long as the United States retains its current force posture, projecting power at long-ranges will be a slow, laborious and costly business.

Resolving the mobility/logistics/sustainment problem will come most directly from addressing several of the other technology areas discussed in this section. The development of global, real time surveillance and communications, long-range strike and lighter ground combat forces will all contribute to reducing the weight of material which must be moved into theater and the requirements to sustain those forward deployed units.

In addition, efforts need to be taken to improve mobility and lift capabilities. Lighter ground forces could more easily be moved by air suggesting a continuing need for a robust air transport capability. Additionally, the exploitation of new technologies in fast sea lift, such as water jet propulsion systems and even wing-in-ground effects need to be carefully examined. The reduction of transit times for medium and heavy vessels from CONUS to the Middle East from weeks to a few days would be of enormous strategic significance for the United States.

- **Low-intensity conflict.** The United States will need robust SOLIC and light infantry forces with which to address low-intensity conflicts and operations-other-than-war. But it will need to provide them with more relevant power. This will include improved protection for the individual soldier, better connectivity between forward deployed troops and distant support forces, and more flexible combat systems. The last term is meant to include so-called nonlethal weapons, those means that can support operations in ambiguous conditions, such as when hostile forces are in close proximity to civilians. Non-lethal systems include agents that can disable equipment, interdict mobility, interfere with the operation of electronic systems, and neutralize personnel all without deliberately causing irreparable harm.

VI. CONCLUDING OBSERVATIONS

In the end, the focus of a new revolution must start with the premise that the current stage of U.S. superpower dominance of foreseeable conflicts will not last forever. What will our current superiority mean if we do face an adversary with nuclear weapons as well as interior lines of communication, land mass to hide in, hard earth to burrow in, etc? What about a so-called peer competitor possessing similar capabilities to our own in the areas of precision strike, space and airborne surveillance, and stealth? Will we face the problem of "high tech trench warfare?" That is indeed moving backwards.

There is no more obvious revolutionary force for the 21st century than that embodied in those capabilities that would enable military operations to, in and from space. Space offers the potential for continuous, near-real time, multispectral surveillance of the globe. Coupled to directed energy weapons, domination of the terrestrial environment is all but assured. What is more revolutionary than the capability to place the equivalent of 50 pounds of high explosive on any point on the globe, the surface of the oceans, the air or outer space, within millimeters of a designated point at light speed? The achievements of the SDI program have identified the capabilities needed to enable the United States to field such a revolutionary military capability. Tailoring it to tactical and operational requirements would exploit the domains of advanced sensors, battle management, communications, and computing. DEW systems that allow power sources to remain on earth reduce transportation and logistics costs for equivalent pounds of energy delivered to target by at least an order-of-magnitude. This will achieve most of the practical objectives of the current precision strike and information warfare agendas with greater return both technologically and strategically.

More important, this fits the new strategic problem which is for the United States to exercise military power or political leverage over distant continents and theaters of war without a major forward presence and while avoiding the need for a protracted mobilization and deployment phase. Such a capability, for space-based weapons would create and simultaneously dominate a new theater of war. It would provide the basis for the defense of CONUS from less exotic threats by adversaries. It threatens to devalue most organizations and force structures for large-scale conventional and nuclear warfare. It exploits a number of interlocking U.S. advantages or core competencies such as dominance of space, large-scale system integration, distance from potential adversaries, etc. Finally, by dominating space, we can make it much more difficult for anyone else to enter the game. At the same time, we force fundamental changes in the way peer or lesser adversaries will be able to carry out their military plans and fight their wars. In a sense, this is like consciously building the first Dreadnought, knowing that it will render obsolete one's own military investments, but confident that the advantages conferred by leading in this area will be both profound and enduring.

Senator SMITH. Thank you very much, Dr. Gouré. That was fascinating testimony from both of you.

Let me start with you, Dr. Gouré. In trying to come to grips with the issues that you describe and the changes that you would like to see in developing a national strategy for defense and offense too—I think sometimes we use the word "defense" to reflect the defensive and not thinking about the offense—is the executive branch of Government, the way it is now, the President, the NSC, the Department of Defense, structured to deal with this?

Let me add one more point. When the transition of power takes place, one wonders where the memory bank really is here. We have policy leaders that come and go. The military stays. The transition, the military Joint Chiefs do not leave at the same time. The Presidents come and go and the new administrations come and go. But can we really continue to pursue a military revolution with DOD in the driver's seat, or should somebody else be in the driver's seat? Who should be in the driver's seat?

Dr. GOURÉ. Well, I think there are two parts and perhaps three to the answer. Number one is there has clearly got to be at the very top level a sense of direction and one of the problems I think we currently have is that unless the White House, the National Security Council, the top leaders are keeping the focus on in fact the long term, on the expectation of a future in which U.S. military power must be use more strategically perhaps against perhaps greater foes, it is very hard for DOD or the services to put forward ideas that are in fact related to that concept. If you have a Bottom-Up Review or a national security strategy that says no higher than theater, probably lower, no real peer competitors out there, it is hard to sort of see the services or anybody really bucking that kind of trend.

DOD is probably the right place for the focus to be by and large except that there is always a tendency to focus too much on technology and the things that relate to dollars and less on concept and strategy. That used to be where the services led. It certainly was during the 1920's and the 1930's. There was no centralized bureaucracy, no leadership in the White House to focus on this issue, but the services could do it, which raises an interesting question.

We tend to be focused now, in part because of Goldwater-Nichols, in part because of our experience, on jointness. One can make an argument that if one wants to be revolutionary, that jointness may hold us back because everybody has to play, because the concerns are very much focused on everybody being able to play together when many of the technologies that may be much more important to turn it over to a lead agency, the lead with respect to the mission, for example, as well as responsibility to develop a capability, and say go make it happen.

When the Navy invented and the Marine Corps carrier and amphibious warfare, they were worried slightly about jointness but not about the other services. The Air Force did its own strategic plan which is an air corps.

So, there may be a question about we are maybe aiming too high and organized too high. We may want to in fact throw it back to the services where in fact there is some revolutionary planning going on sort of in the bowels.

Senator SMITH. Are the planners and thinkers, the far-reaching thinkers, the real thought people, having significant impact? I do not mean to pick on this administration. In past administrations, including this one, are they getting the input directly into the DOD, or are we simply stalled in a current memory situation without the proper input?

Dr. KREPINEVICH. Well, I think there are rather enormous disincentives to change in the Pentagon. Again, the danger to our security right now is relatively low. You also have an organization that has been very successful. It won the Cold War. It won the Gulf war in spectacular fashion. The military also typically has a higher regard for tradition. DOD also suffers from a low rate of feedback. The military is not like General Motors. It does not get feedback every day on how well it is doing versus its competitors. Yet some factors are changing dramatically, but it does not know if it is as dominant today as it was 3 or 4 years ago in Desert Storm.

Tight budgets have made the services—at least some of the general officers that I talk to ask the question: "Where is my incentive? If I want to give up some of my traditional systems in order to go off and innovate, I get the feeling that you will take what I am offering, but you will not support what I am trying to do."

Some people argue that we are changing, that we are getting smaller. But unfortunately, "smaller and the same" is not "smaller and very different," which is what I believe is the direction the Pentagon needs to go.

As Mr. Marshall said, typically large organizations take a fairly long period of time to change. As you pointed out, Mr. Chairman, the short tenure of key leaders, Senior leaders in the executive branch only 2 or 3 or 4 years. This makes it difficult to shepherd a major transition through its conclusion, and it also gives these leaders a rather short-term focus on things. People have a natural tendency to try to worry about things not going wrong on their "watch", and so consequently, their focus tends to be on the near term (near-term readiness for example) at the expense of long-term readiness.

Finally, I think that some people want to believe that if the Pentagon becomes more efficient at what it does, that this is the same as the Pentagon becoming more effective or more competitive 10 or 20 years into the future, and that is not necessarily the case either.

Senator SMITH. I have to believe—I could be wrong—that there is a great sense of frustration for those who develop these concepts and these systems. Obviously, I am not speaking out against the right of policy makers when they assume office to change direction, but you have in the Defense Department the warfighters, the folks that carry out and execute with the best that we give them and have done a tremendous job over the years, certainly in the Cold War and the Persian Gulf, the most recent. Then you have the policy folks who come in basically with preconceived ideas, build SDI, do not build SDI, build the B–1 bomber, do not build the B–1 bomber. But also at the same time somewhere in there are the folks that believe real strongly in that B–1 bomber or SDI or missile defense or whatever it is. Where do they fit into this equation? How much respect are they given?

If they do not have the right access to both the warfighters and the policy people and it is always the policy that directs the warfighters without the other third factor being included in there, we could be the losers for that. Policy is not always right. It has a right to be wrong. Do not misunderstand me, but I think it also has a right to hear both sides from the thinkers, from those who are developing these new systems. Is that being done? Is that happening today?

Dr. KREPINEVICH. There are innovators in the Pentagon, Mr. Chairman. We just heard from two of them.

Senator SMITH. I know they are in there, but are they being heard?

Dr. KREPINEVICH. One problem they run into is that the system that we use—the PPBS system—and the way we structure our budgets were developed during the Cold War when you had a clear threat against which to baseline yourself. Then the Soviets were building fighters that were better than the one they currently had. Well, our response was pretty straight-forward. We go out and build one that is better than we had at the time. It was all relatively clear. The budget categories were structured around familiar missions. The focus basically was on eliminating uncertainty, and focusing on short-term tradeoffs. These are all characteristics of a planning system that was adequate for the Cold War. But now we are in a situation, as I mentioned earlier, of far greater uncertainty. We basically have to adopt a hedging strategy. So, for someone to say "this is the weapon system we need and I know that with a high degree of confidence it seems to me some what extent presumptuous.

As Dr. Gouré was saying, we need to develop a vision of what this military revolution is going to do to the character of conflict. Then we need to begin to experiment to narrow the range of uncertainty. You start out with a vision. Uncertainty is broad. You do some thinking, some simulations, some war-gaming. At some point, as Mr. Marshall said, if you think you are on to a hot idea, you begin to produce a small number of systems. You take them out into the field and you integrate them. You take them through field exercises. What you are doing essentially is, over time, you are building some strategic options for yourself.

A classic example of this would be the aircraft carrier. The Navy built the Langley in the early 1920s. It turned out to be the wrong kind of carrier, but they learned a few things. Going into World War II, we still had a battleship Navy, but the U.S. Navy, thanks to Admiral Moffett and, quite frankly, thanks to some supporters on the Hill, had built a few large deck aircraft carriers. They converted two battle cruisers into the Saratoga and the Lexington. They tried them out. They sailed them around. They flew planes off them so that when the war came and it became clear that it was carriers and not battleships, that would be decisive, the U.S. Navy had deployed enough of a hedging strategy so that it could transition rather rapidly to a carrier-based Navy as opposed to a battleship dominated Navy.

Senator SMITH. My time is expired, but I want to make a point here. The stakes are higher than ever as we move into this highly technical, sophisticated warfare, and if the American people do not know what this vision is, they cannot pass judgment appropriately on those who would execute it. I think that some of you who are visionaries on these types of things need to speak out more so that the American people have the opportunity to learn more about this. That is what we are here for today. Otherwise, it is simply a reactionary situation to whatever policy happens to be in place. It may not be the right policy, but people who are executing it are elected and so be it.

I think having that vision out there—much like the example of Kennedy I gave to the first panel. He said build, let us go to the moon, never mind, let us just go, and we will get it done. Or Reagan with the SDI, let us explore this concept. In the case of John Kennedy I think people passed judgment on him in 1964 based on that, and I think people passed judgment on Reagan in part because of that concept on SDI. That is my point.

I think there has to be a connect, and I am not sure it is always there. I sense there is a frustration level with some of the folks who are the innovators. Maybe I am wrong.

Dr. GOURÉ. My thought is, Senator, that is why I think that a revolution has to start with, if you will, a political statement, a statement of the concept.

Senator SMITH. You agree with me.

Dr. GOURÉ. I certainly do because otherwise it is all technology and the public is simply going to have to flip a coin.

Senator SMITH. Thank you. Senator Bingaman.

Senator BINGAMAN. If you are right, that it starts with a political statement, are we to a stage in our understanding of the world, a changed world, that we can say that the present idea that we are going to maintain our capability to fight two regional wars at the same time is crazy, we ought to get rid of that idea, the idea that we need 1.4 million people in uniform is crazy? It just does not comport with the real world anymore. We ought to get rid of that idea?

We are on a track to continuing with that basic strategic construct of the threat or the capability that is necessary for the rest of this decade. Are we wasting an awful lot in resources by sticking to that in your views? I would be anxious to hear either one of you.

Dr. KREPINEVICH. Senator, one preliminary comment. I do not agree that military revolutions are driven by political statements. If you look at the Napoleonic revolution or the inter-war revolution or the nuclear revolution, they really were not driven by political statements at all. They were driven by a surge in technology and to some extent, the need to solve a strategic problem.

But in terms of the two-war strategy, basically I think we are in a situation that strategic planners have faced for time immemorial, which is you have a limited amount of resources to employ to minimize the overall risk to your security. I think perhaps reflecting our Cold War experience and how organizations typically act in general, we have chosen to focus, overemphasize in my estimation, the greatest near-term challenges to our security which also happen to be the most familiar: major regional conflicts that are extrapolations from the Gulf war. The threat that we are baselining ourselves against is a threat that existed in the past. It is not going to be there in 10 or 12 years when our force enhancements hopefully come on line. If you look at the situation, what is striking is that we have essentially one scenario in the Bottom-Up Review that is driving our planning and our investment when we are in a world that is characterized by great uncertainty. It strikes me as ironic that we are war gaming this scenario, as Admiral Owens and Mr. Marshall mentioned, with games that are essentially obsolete because they cannot address the information dimension of conflict which is the dimension that is radically transforming warfare.

It strikes me as odd that we are using the same measures of effectiveness to gauge how we will do in future conflicts that were used for the old central front contingency in Europe during the Cold War. This approach to strategic planning and budgeting in the Pentagon seems to me to place too much emphasis on near-term familiar threats and not enough on developing hedges against the greater threats that we are likely to face down the road.

Senator BINGAMAN. Dr. Gouré?

Dr. GOURÉ. It seems to me there are two issues. The first one is that the current approach is not sustainable. My Center has done a great deal of work on that, as has Dr. Krepinevich's, and basically we cannot continue to do business the old-fashioned way for much longer. So, change is going to come to us. The question is do we take advantage of it or does it take advantage of us. I would much prefer the former.

With that in mind, I would argue that we need to do more than simply hedge. We need to begin to have a debate, whether it is an experts debate or a political debate, as to how the United States wants to be in the world, what threats we are going to see out there not just in 5 years, but 10, 15, or 20, and in that context begin to pick and choose or prioritize among the technologies that we have in front of us. In a sense, you need to come up with the vision, as did the inter-war planners.

We did not come up with the notion of amphibious operations just because the technology was there. In fact, it almost was not there. Really the concept that the Navy and Marine Corps came up with is we are going to have to go across the Pacific and beat somebody on the other side of it. They did not know when it was going to happen and they were not even sure if it was going to happen. But they set themselves that strategic problem and then they began to work on the technologies and the operations.

So, in a sense you have to have an argument about where the United States is going to be in the world, how do we want to conduct ourselves, what is the role of the military force going to be, how much of it do we want to have, what is our budget top line, and then of that top line, how much are you going to spend to push ourselves into the future, and what do you give up for that if it is a matter of tradeoffs.

Senator SMITH. I think, Dr. Gouré, in your case—and I would like you to comment too, Dr. Krepinevich—I think you believe that we ought to be putting our assets certainly in space, the ballistic missile defenses, and space-based sensors, and all of that. Do you disagree with that?

Dr. KREPINEVICH. I guess to summarize, I think that we ought to be investing in a period of uncertainty in creating some strategic options for ourselves. They do not have to be expensive. They ought to be oriented on something that Dr. Gouré and I agree on. We need to have some sort of vision on where the military revolution is going to take the character of conflict.

For example, military revolutions tend to bring about new kinds of dominant military operations. Is information dominance going to be a new kind of military operation, the way we think of air superiority? Is space control going to be a new kind of military operation, the way that we think of command of the seas? Is long-range precision strike going to be a new kind of military operation? Is ballistic missile defense and cruise missile defense going to be a very new and different kind of military operation? Will those be the operations that essentially correspond to the kinds of carrier air operations that transformed warfare at sea between the world wars?

So, I think we need to basically try to achieve the intellectual breakthroughs that Mr. Marshall was talking about—and we have some time to do that because the danger is relatively low—to identify what works and what does not work. For instance, if deep strike is a new mission, the Army is standing up, the EXFOR, this experimental force brigade down at Fort Hood, Texas. Well, right now it is underfunded by about $100 million in 1996.

However, the EXFOR is more oriented toward making mechanized units perform more effectively then toward trying to identify what kind of new operations or organizations might be required to really exploit this military revolution.

Senator SMITH. Where do you two differ? In your statements I see some difference, but in your testimony you are blending together and you are losing me here. What is the essential difference between the two of you?

Dr. GOURÉ. Well, I think—and Dr. Krepinevich can correct me—the differences are a couple. I am looking at this problem top down. He wants to argue bottom up. It is like talking about telecoms policy by trying to start the debate as to which is the best avenue, cable, Bell Tel, direct broadcast. I want to start the other way and say what I do want to have is broadly distributed, open market, all the way down to the individual householder, and I am then going to let the players play it out and see which one gives me the best capability to get the strategic objective that I want. So, we differ as to sort of which end of the problem we are approaching, number one.

Number two, I think that frankly the future is not one of uncertainty bluntly put. I think we are already beginning to see the outline of what it is going to be. Senator Nunn began to allude to some of that. We may not have the Russians for 10 years, but 15, 20 years I suspect we will have. We will have the Chinese to deal with, whether it is a war or simply as a competitor, potentially a rival, possibly an adversary. There are others out there who are building their own sort of stake in the world and their own place. We are going to have to be able to deal with those people very specifically and do it from afar. So, I tend to think that the answers are becoming much clearer than I think Dr. Krepinevich does.

Senator SMITH. Do you agree with his analysis?

Dr. KREPINEVICH. Well, I would agree with Dr. Gouré that we disagree over the issue of whether the future is clear or uncertain. All history tells you is that it is the norm that great powers compete and that military technology diffuses. But we have no idea what great power is going to present the next challenge to the United States, and it would be enormously different for our defense if it were, say, a country like Russia as opposed to a country like China.

Even if the Russians were to compete, as was mentioned earlier, it is not necessarily the case that they will compete in the way they did during the Cold War given the surge in technology. Nor is it at all clear to me how even earlier emerging threats in the third world might react to the explosion in technology. Look at the investment pattern the Iranians are taking, for example, which is different from the pattern the Koreans are taking, which is different from the pattern the Iraqis are taking. Every country will exploit the military revolution according to its objectives, according to its geography, according to its technical competence.

Did we know in the 1920s how that military revolution would turn out? You can go back and look. Nobody really knew. Some people had ideas of what might emerge, but States tended to go down different paths. The Germans, for example, developed mechanized air-land operations. The Japanese did not do that at all. So, it made a great difference whether you were going to be competing with the Germans or the Japanese. It would have dramatically influenced your investments, what you emphasized. My point is that there is an enormous level of uncertainty involved.

Senator SMITH. Let me ask a final question and I do not know if Senator Bingaman may have another question.

We have asked questions of both panels about the structure in the executive branch. Let me ask you just to pass brief comment on our structure here in the Armed Services Committee in the Senate. As I understand it—I was not here then—the subcommittees were essentially organized the way they are now by John Tower during his chairmanship in the early 1980s, and we have had a lot of changes since then. We have massaged it a little bit, changed the names a little bit and moved a little bit around, but for the most part, it is pretty much the same as it was then.

Is that sufficient? Are we structured properly to deal with the new technologies, the new threats, the new innovations and concepts that are coming our way by leaving the subcommittee structure essentially the way it is here in the Armed Services Committee? Here is your chance to really zero in on us. [Laughter.]

Senator SMITH. I do not know if we will listen to you.

Dr. KREPINEVICH. Well, I would not presume to advise you.

Senator SMITH. Go ahead. I want to hear it.

Dr. KREPINEVICH. Basically, Mr. Chairman, it seems to me that we are going to have to think differently. Goldwater-Nichols was just the beginning. We are going to have to look at the fact that military operations, especially among the more advanced military, are becoming integrated at progressively higher levels.

When Admiral Owens talks about systems of systems, he is talking about the fact that when the Army thinks about building its next ATACMs and it goes out 200 miles, it should not just be the Army that thinks about that and the corps commander because increasingly the services are going to influence and are influencing what goes on in the other traditional battle space. So, I think we are going to have to look at this in a much more integrated way than we have in the past. You are going to be able, for example, to dominate operations far out to sea not only from land-based aircraft, but actually from forces based on land. So, that is one aspect.

Certainly experimentation and innovation. I think we are going to have to be willing to encourage that and monitor it and support it and nurture it and sustain it. It is not going to cost a lot of money, but it is key and essential to really realizing the payoffs of those potential intellectual breakthroughs.

I think we are going to have to think very differently about budgeting to basically look and emphasize more the long term and perhaps, as Admiral Owens is doing through his joint warfighting assessment areas, begin to think about warfighting in different categories than we have in the past.

So, those are some of the sorts of things that I would say might influence a restructuring over here.

Dr. GOURÉ. My thoughts are somewhat similar. If one believes in this revolution, whichever mode one wants to take, then one can begin to think about reorganizing along those lines. One issue, for example, which is very tough to place anywhere specifically in the Congress—and it is all over the place—is the whole question of dual-use. It is clearly going to be of dramatic importance in the future both to our military and also to what comes out of other people's militaries, what they are going to acquire, whether it is tech transfer or simply in the process of diffusion. How does that get handled? Do we talk about a joint committee and then who would sit on that kind of thing?

Do you want to focus it by JWACA areas, joint warfare assessment sort of capability areas? That is another possibility. Treat this thing without reference to the old domains, land, sea, and air but kind of cross that into warfighting domains.

The last question, of course, is that this subcommittee deals with acquisition and technology, but if we buy the argument about innovation and the sort of conceptual operational innovation, perhaps that should be a third leg that gets added to the responsibility of this committee. That would give you a better chance of getting into questions of modeling, virtual battlefield, a lot of those areas that do seem to be important, oversight over modeling capabilities, all those kinds of things. In fact, operational innovation may be something to add even though it crosses some of the old jurisdictional lines.

Senator SMITH. Senator Bingaman, anything else?

Senator BINGAMAN. Yes. Let me just ask what seems obvious to me but maybe I am missing something in what you are saying. The statement that we need to look at the long-term security needs and strategic options for us in the long-term and emphasize that more than the short-term leads me to conclude that you are essentially saying a little bit in code, in the 5-year plan we need to be building to a smaller force structure and we need to be deemphasizing readiness. Am I wrong?

Dr. KREPINEVICH. Senator, I would agree with you for the most part. I think that the existing force structure, as presented in the Bottom-Up Review, is not likely to be sustainable over the long-term with the resources that the administration is currently programming for defense. In fact, the Army has just been told to stand down below the levels established in the Bottom-Up Review. I think that is a reflection of some of the modernization-readiness tensions you alluded to.

That does not mean that the force should not be ready. It means that we probably will have to make some tough choices, one of which it seems to me is to accept some small increase in near-term risk by reducing our force structure so that we can better position ourselves to minimize risk over the long term. When you go to a smaller force structure, you relieve stress on the manpower, on readiness, and on the modernization accounts for that matter. In so doing you can have a ready force that is smaller, but it is also a force that you can sustain in readiness over time not only in terms of near-term readiness but in terms of modernizing it adequately and exploiting the military revolution to keep that force competitive over time.

Dr. GOURÉ. I would add to what Dr. Krepinevich said with one more point, which is one needs to find some number of dollars, probably a little more than he is talking about but not a huge amount, to begin to fund or push some of the technologies that I have been talking about, ensure that we get the full panoply of space-based systems, the broader capabilities in C^4I and long-range strike.

That probably has to come at the expense—at the margin of existing capabilities or the ones that are the near term modernizations. So, I would say that perhaps in addition to drawing the force down in order to keep it ready and to keep it under the budget ceiling, one might want to take an additional sort of razor cut at that in order to find the additional funds for the long-term.

Senator BINGAMAN. Do either of you have a figure as to what the proper level of force structure should be given to the projected budgets? Senator Domenici will propose a budget resolution that keeps us where we are until the fourth year and then we start going up by 1 percent.

Dr. GOURÉ. I have a report that we have done at the Center down at the end of the table there. We estimate that you are probably going to have to come down by another 20 to 25 percent.

Senator BINGAMAN. From the 1.45.

Dr. GOURÉ. Yes, sir. That depends. If you want to keep the 1.4, if you do not want to do it in a balanced fashion, you are going to find yourself essentially out of money for modernization near term or far term. So, if you are balancing this, trying to keep a modernization program going, long-term R&D, you are probably come down to a million, thereabouts, as being the level that is affordable over the long term.

Senator BINGAMAN. Do you have any thoughts on that?

Dr. KREPINEVICH. Yes, Senator. This is one area where Dr. Gouré and I do disagree.

We think that Dr. Gouré's estimate of the funding shortfall is far too pessimistic. We think that you can sustain a force of about 1.2 million over the long term. Of course, this depends on myriad factors, one of which is the appropriate R&D budget level.

If the commercial sector is going to be an increasingly important player in R&D, then that is something that I think we have to look at in deciding the level of the R&D budget. If we baseline ourselves even against the Cold War, the R&D budget we have right now is about 10 percent greater on average than that which we had in the Cold War. It is going, around the turn of the century, to about 10 percent less than we had on average during the Cold War.

So, determining R&D funding it becomes kind of interesting. Are we baselining ourselves against the old Soviet threat? Are we baselining ourselves against ourselves in the Cold War? What is the impact on commercial technologies on defense R&D, especially since any country can draw upon the technology of the commercial sector's huge R&D budget by buying off the commercial market.

Senator BINGAMAN. Thank you very much.

Senator SMITH. I want to thank both of you very much. We appreciate your candor and your challenges, and it is very much appreciated.

Without objection, Senator Bingaman, I am going to leave the record open until Friday, the 12th, for any additional questions that any member of the Senate may want to pose to you and an additional week for you to respond if those questions are posed.

Dr. GOURÉ. Thank you, Mr. Chairman.

Dr. KREPINEVICH. Thank you, sir.

Senator SMITH. Thank you again and the hearing is adjourned.

[Whereupon, at 11:14 a.m., the subcommittee was adjourned.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1996, AND THE FUTURE YEARS DEFENSE PROGRAM

WEDNESDAY, MAY 17, 1995

U.S. SENATE
SUBCOMMITTEE ON ACQUISITION AND TECHNOLOGY,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

DUAL-USE TECHNOLOGY PROGRAMS

The committee met, pursuant to notice, at 2:38 p.m., in room SR–222, Russell Senate Office Building, Senator Bob Smith (chairman of the subcommittee) presiding.

Committee members present: Senators Smith, Bingaman, Lieberman, and Nunn

Professional staff members present: Jonathan L. Etherton, Cord A. Sterling.

Minority staff members present: Andrew S. Effron, minority counsel; and John W. Douglass, professional staff member.

Staff assistant present: Pamela L. Farrell.

Committee members' assistants present: Thomas L. Lankford, assistant to Senator Smith; Edward McGaffigan, Jr., assistant to Senator Bingaman; John P. Stevens, assistant to Senator Glenn.

OPENING STATEMENT OF SENATOR BOB SMITH, CHAIRMAN

Senator SMITH. The hearing will come to order. This afternoon we welcome three witnesses to address the issues surrounding the so-called dual-use technology programs in the Department of Defense.

The President's budget request for fiscal year 1996 includes nearly $2 billion in Defense Department funding for designated dual-use technology programs. This is about 25 percent of the technology-based program budget under the Acquisition and Technology Subcommittee's jurisdiction.

The share of the technology-based budget devoted to dual-use programs is, in fact, growing, and it is appropriate that we focus our attention on the status of these programs and their relative priority.

At the outset, let me state that I support the concept of greater integration of defense and commercial research and development activities.

It is clear that in many of the technologies most critical to our future national security, the commercial marketplace, not the Department of Defense, is setting the pace.

And in many cases, these are the technologies that will drive the coming revolution in military affairs. This was the subject of a recent subcommittee hearing.

But in the areas of advanced electronics and information technology, the Department of Defense will rely on innovations from the commercial sector for weapon upgrades and for new command, control, communications, and intelligence processing capabilities.

Since the late 1980s, largely at the prodding of Congress, the Department of Defense has engaged in a number of innovative partnerships between industry and academia and research and development.

These creative approaches to development have offered a number of advantages, including our ability to leverage investments from the private sector, rather than having the taxpayers foot the entire bill for the new technology development.

I believe we should expand the cost-sharing approach into any technology program that has a high potential for commercialization.

Such partnerships also create a more effective conduit to the user community for the insertion of new technologies from the commercial sector into the weapons systems and subsystems.

But at the same time, there are a number of serious pitfalls that dual-use programs may be subject to. We run the risk of making investments that might benefit the commercial sector to a greater degree than the defense user community.

And in our desire to make partnering attractive to commercial companies, we may be placing too great an emphasis on commercial potential in the selection of projects for funding.

We must also take care to ensure that governmental funding decisions not distort the free-market forces that select winning technologies and determine the flow of investment capital.

And finally, we ought to ensure that DOD's role in dual-use technology development be justified, not only on the basis of continued and direct military relevance, but also within a structure of concrete milestones and exit criteria.

We cannot afford to create technology entitlement programs. That is the point that I am trying to make here.

In a few weeks, we will mark up the defense bill, and we will face some very difficult choices in balancing the various programs in the technology accounts. So that there cannot be any confusion, I want to make this issue clear, as I am concerned.

As the Chairman of the subcommittee, I intend to apply a fundamental litmus test to every program within the subcommittee's jurisdiction, and that is, if there is a defense investment there has to be a defense return, period.

If a program cannot sustain itself under those criteria and that scrutiny, it will not be funded. It is my hope that our witnesses today will help us to better understand this, and I remain open minded on these programs.

Before we begin, I certainly want to express my appreciation for the willingness of all of our witnesses to appear together on the panel this afternoon, especially you, Dr. Kaminski. I appreciate it very much.

By allowing us to set aside protocol, we can speed up the process a little bit, and for that, we are very grateful.

At this point, let me welcome all of the witnesses, and remind you all that your statements are a part of the formal record, and will be so entered, and if you could summarize in five minutes, we would appreciate it. Dr. Kaminski.

Dr. KAMINSKI. Thank you, Mr. Chairman. I will submit my formal statement for the record and——

Senator SMITH. I am sorry. I apologize. Before we start with the witnesses, let me turn to ranking members. Senator Bingaman, I apologize.

Senator BINGAMAN. No problem. No problem. I will be glad to do this after the witnesses.

I did want to give a short statement that is very much in line with the statement Senator Smith just gave, and, of course, thank the witnesses for being here.

Dr. Kaminski, I understand you are spending a lot of time up here testifying before committees, and particularly, we thank you, and Dr. Hermann as well.

Mr. Cooper is always here, at least before this committee. We appreciate him being here again.

I think that this is a very important issue, because there is some misunderstanding abroad about what is involved in dual-use technologies.

When you talk about dual-use technology here in the Congress, many people think that you are either talking about commercial technology, or you are just talking about the TRP, the Technology Reinvestment Program.

While both of those include dual-use technology, neither consists solely of dual-use technology. The definition I would like to put forward for consideration, I think it is consistent with what Senator Smith just said in his statement, is that dual-use technology is technology that the Defense Department needs to have in its future, which has commercial as well as military use.

That definition, I think, keeps us focused on being sure there is a military payback for any military investment, which I think was the test that Senator Smith referred to.

When this condition exists, and in my view it exists more often every day, as commercial technology becomes more and more of the driver in leading-edge technology, I believe that in that circumstance it makes sense for the Department of Defense to find commercial partners, which can help pay the cost of developing the technology.

This definition is not accepted by some who are critical of the TRP program, and who seem to confuse the TRP program with commercial research, in general.

These critics seem to feel that the TRP is funding considerable amounts of commercial technology that do not have military value and do not return a value to the military.

These concerns with the TRP program then seem to get generalized into opposition to the Pentagon's dual-use research programs in general, as non-defense items, and in the defense budget, or even worse, as corporate welfare.

President Clinton has proposed a research, test and evaluation budget of just over $34 billion for this next fiscal year. That is one of the lowest RDT&E budgets in many years.

The technology-base portion of the budget is also one of the lowest in recent memory. These declining budgets mean that we have less and less margin for error in the decisions about where to invest our research dollars. We need to husband our investments for those programs that ensure our security in the years ahead.

In this difficult fiscal environment, the Pentagon cannot afford to pay 100 percent of the costs for research that also has a high value for the commercial sector.

It cannot afford to duplicate research that has already been done in the commercial sector. I think we really have no alternative but to leverage the commercial research and development capabilities that exist wherever we can.

Senator Smith referred to the hearing we had a few days ago with Admiral Owens, where he talked about dominant battle field awareness as his vision for the future warfare, and the capability that he thinks is going to be the key to our future defense capability.

As he pointed out, this dominant battlefield awareness is based almost totally on the use of dual-use technologies. And I am confident that this is typical of much of the cutting edge of technology.

Since the size of the Department of Defense budget has declined in recent years, the Pentagon has begun to rely more and more on dual-use technology programs. In my opinion, we should not be asking why we rely so heavily upon them.

Really, the burden should be on the other side, and we should be asking in any of those programs where we are paying 100 percent why, in fact, we cannot leverage commercial investments to help us make the necessary R&D—accomplish the necessary R&D, particularly in this dual-use area.

So I do think this is a very important set of issues. There has been bipartisan support under three presidents for this general dual-use strategy, and we have had strong support in this committee and this subcommittee for a decade, starting with SEMATECH, when President Reagan began that initiative, continuing with the high-performance computing, with the MIMIC program, with advanced materials, with other programs under President Bush, with similar programs under this President.

I think we have been pursuing a sound course, and I hope very much we can continue to do so. So thank you very much, Mr. Chairman, for having this hearing.

Senator SMITH. Thank you, Senator Bingaman. Distinguished ranking member, Senator Nunn.

Senator NUNN. Thank you, Senator Bingaman, for your hard work, and I appreciate the witnesses being here.

It is an important area of concern, and it will be important for us to have as much understanding as possible about what the programs are, indeed, doing, and as you said, Mr. Chairman, how they tie into our defense needs and our security needs.

So I am interested in hearing from the witnesses, and participating in the hearing.

Senator SMITH. Senator Lieberman.

STATEMENT OF HON. JOSEPH I. LIEBERMAN, A U.S. SENATOR FROM THE STATE OF CONNECTICUT

Senator LIEBERMAN. I have a statement, which I ask be included in the record.

Senator SMITH. Without objection.

Senator LIEBERMAN. I agree with pretty much everything that has been said up to now. I thank you for your opening statement and your general support of these programs, and I agree with you that the only way to sustain them, and I think it is critical that we do, is to make sure that they have relevance to our military. I look forward to the witnesses.

[The prepared statement of Senator Lieberman follows:]

PREPARED STATEMENT BY SENATOR JOSEPH LIEBERMAN

I want to take this opportunity to thank you Mr. Chairman for holding this hearing on these important programs. It is imperative that we gather the information that is necessary in order for us to accurately evaluate the effectiveness of the concept of dual-use in general and the Technology Reinvestment Project in particular. I have been a strong supporter of investing in defense technology, in a cost effective manner, to ensure our military preparedness in the future. Defense spending must meet not only current needs, but also must be concerned about the national security threats of our future. We are at a time when budget concerns are of paramount importance, and we are being forced to make many painful decisions. There is no doubt that cuts will be made, but we must be careful in our zeal to decrease the deficit that we do not cut programs that are allowing us to perform our essential tasks in a more cost effective manner.

We cannot compromise our national security, but we can use innovative thinking to change our old paradigms into more economically efficient new ones. Today we are examining programs that are striving to leverage our precious defense budget allocations to provide more military technology for fewer defense dollars. I welcome the opportunity to take a look at the progress of the TRP, and to explore the implementation of a dual-use philosophy more generally. It is ideas like these that we need to encourage, learn from, and exploit to make sure that we maintain our position as the leader in military technology. We cannot afford to rest on our laurels and expect to maintain our military technological edge, nor can we afford to have our military solely responsible for all of our defense technology needs as we have historically.

We are on the verge of a revolution in defense technology and we must stay in the lead in that revolution. A 1 or 2 year interruption in research and development is a lifetime in the field of high technology. We have no choice but to constantly seek out the best ways to proceed and to make sure that we have adequate funding to ensure that the necessary progress in technology development is taking place.

The defense technology base that spawned the technology revolution is now being dwarfed by the technology development in the civilian sector. Our military no longer controls the availability of technology that has the power to be effective in military application. The technology is already in the civilian marketplace. Our competitors can already buy the technology they need on the open market. We must capitalize on the innovation that is taking place in the civilian sector if we are to keep pace with the rest of the world, much less lead them.

In closing, I would like to thank the members of the panel for being here today to participate in this important discussion.

Senator SMITH. Without objection, I would also enter a statement submitted by Senator McCain, for the record. It is something that will get your attention.

He is calling for the termination of the TRP program; however, saying he would support funding for the development of technologies with both defense and commercial applications, as long as the preponderance of the application of the technology can be demonstrated to be defense related.

So I would ask that that be submitted as part of the record.

[The prepared statement of Senator McCain follows:]

PREPARED STATEMENT OF HON. JOHN MCCAIN, A U.S. SENATOR FROM THE STATE OF ARIZONA

Mr. Chairman, I am not a member of the Acquisition and Technology Subcommittee, and I appreciate very much the opportunity to make a brief statement and ask just a few questions of the witnesses today.

As everyone in this room probably knows, I have been an outspoken critic of the Technology Reinvestment Program (TRP) in recent months. Several years ago, when Congress authorized a number of defense conversion programs, I was very supportive of dual-use technology development programs as part of that effort. Unfortunately, however, in the implementation of some of these programs, the original goals of the programs have been skewed.

The TRP is, I believe, an example of a program that has failed to achieve what most of us thought was intended at its inception. There are two reasons for this failure. The Congress has politicized the TRP by earmarking funds for particular projects in Members' home States and districts. Admittedly, the Pentagon has generally been successful in resisting the political pressure of Congress. Nonetheless, the program has been turned into a government-wide effort focused on general technology development with little attention given to military need. The bottom line is that defense dollars are being spent to support commercialization of defense-funded technologies and other projects with little, if any, relevance to our military requirements.

The fact is that the defense budget cannot afford such a broadly based technology development program. Scarce defense dollars should be focused closely on developing new technologies which will contribute to the ability of our Armed Forces to carry out their primary mission of defending our Nation.

My view is that the TRP specifically should be terminated. I do not believe this program can be reconfigured effectively or relieved of the taint of politicization.

I believe simply that technology development programs, funded with limited defense dollars, should be predominantly relevant to high priority military requirements. However, I would support funding for development of technologies with both defense and commercial application, so long as the preponderance of the application of the technology can be demonstrated to be defense-related.

I hope to work with Chairman Smith to amend existing law to require some test of defense relevance before providing funding for any program designed to promote dual-use technology development.

Along these lines, I have just a few questions to ask our witnesses on the concerns I have raised above.

Senator SMITH. At this time, Mr. Secretary, proceed. I apologize for having to interrupt you as the result of my own mistake.

STATEMENT OF PAUL G. KAMINSKI, UNDER SECRETARY OF DEFENSE FOR ACQUISITION AND TECHNOLOGY

Dr. KAMINSKI. Thank you, Mr. Chairman.

I will submit my formal statement for the record, and then just do an abbreviated verbal statement and a couple of charts.

Over the past 30 years, the evolutionary change in the industrial base that supports DOD is no less dramatic than the changes in the world order since the demise of the former Soviet Union. While DOD purchases over this period have declined, America's commercial markets have continued to expand.

The first chart illustrates R&D investment expenditures by DOD and by private industry since the 1960s. In aggregate terms, commercial industry surpassed the DOD in R&D spending, as you can see, in 1965, and the disparity between the DOD and commercial sector investment in R&D has been growing wider ever since.

This difference means that relatively more of this nation's technological momentum will be based on what is coming out of essentially commercial enterprises in the future.

The bottom line is that we have no choice but to move from separate industrial sectors for the defense and the commercial markets, to an integrated national industrial base. Leveraging commercial technological advances to create military advantage is critical to ensuring that our equipment remains the most advanced in the world.

The Department's dual-use investment strategy is documented in a February 1995 DOD report entitled, "Dual-Use Technology: A Defense Strategy for Affordable, Leading-Edge Technology."

This strategy builds on the Department's efforts to improve the defense acquisition process. Improved procurement business practices are the foundation for these efforts to establish an integrated defense-commercial industrial base.

The Department's dual-use strategy here contains three underlying pillars. The first is investing in dual-use technologies critical to military applications; the second, integrating military and commercial production, where possible; and the third, the insertion of commercial components and subsystems into military systems.

The first pillar involves leveraging the commercial sector's technology base investment. Commercial industry is now the technological agent of change in information systems, telecommunications, and microelectronics—three areas critical to DOD's leading edge.

The Department's dual-use technology program is tailored to leverage off the commercial technology base, without the taxpayer having to make the entire root investment.

The second pillar is the "dual produce" concept. The Department is putting a great deal of emphasis on taking advantage of commercial production to manufacture defense equipment.

Now, while I do not expect that we will soon shift to produce the preponderance of our major weapon system platforms on commercial lines, I do expect that we can and will be doing much more to exploit commercial production at the key subsystem and critical component level of assembly, and to assert those subsystems and critical components into our defense weapon systems.

The third piece of the strategy calls for DOD to make those investments that are needed to facilitate the use of commercial components in our defense systems. The objective here is to have our systems designed for dual-use.

This pillar recognizes that acquisition reform and dual-use technology investments are not, by themselves, sufficient to ensure commercial components are used in military systems.

Program managers and contractors still face up-front costs and risks in adopting commercial products and technologies; for example, the costs associated with determining that a commercial integrated circuit will withstand the necessary extremes of temperature or humidity, or the cost of engineering a commercial component to fit a particular military system.

Where it makes sense, DOD must offset these costs and risks at a level of organization that shares rather than duplicates the common costs.

I think an example is in order to illustrate this strategy, and a good example of our implementation is in the field of electronic packaging called Multi-Chip Modules, or MCMs. The strategy, I think, is well illustrated in this chart.

This chart plots the share of the market on the ordinate, versus time on the abscissa. As we start out, what we see here is the entire market share in 1990 was military. This was high-end use, with critical packaging required, and the market was driven by DOD use.

If we look at the total market size, that is the yellow curve, and it goes with the scale that is on the right, so you can see that while DOD was the entire user, the market was so small you could not see it on the chart.

Well, as time goes on, our forecast is that by the year 2000, the market for this MCM technology will exceed $700 million, the annual market, and there will be a migration as time goes on, in which DOD's market share moves from a hundred percent to about ten percent or so of the total process.

What is opening up the market in this situation is cost. As the cost of MCM technology comes down to make it affordable for commercial use, we will start to have widespread applications in other arenas.

Now, this chart illustrates one other interesting parameter. This dual-use application here involves, in some cases, increased performance, but largely what we are looking at here is reduced cost.

We will be able to buy off of a commercial line, and we would get the same functionality for a reduced cost.

One thing I would draw your attention to, as Mr. Cooper describes the GAO analysis of our dual-use and TRP programs, is a category system which directly and indirectly benefits the Department of Defense.

I have no objection to the categories, but I just want to note that in many cases our objective is one simply of reduced costs. We may not be looking for any more performance, we are looking for reduced cost.

In that categorization of direct benefit or indirect benefit for DOD and the TRP program, those actions taken simply to reduce costs end up in the indirect benefit category.

It is a consistent definition and used throughout, but I wanted to point that out because in many cases what I am interested in is reduced costs for the DOD, and I may not be interested in improved performance to go with it, or I may be, depending upon the application.

This effort illustrates some of both, and it is a good illustrative effort, because it pulls together all three pillars of our dual-use strategy—support for advanced R&D, support for the design and production infrastructure that will allow us to dual produce in commercial facilities, and also support for the early insertion of MCMs into military systems, where they can make a difference. The effort also illustrates how a variety of policy tools are used by the DOD to implement this strategy.

The TRP program is supporting several consortia, which, with the aid of cost-shared partnerships with industry, are exploring different technical approaches to manufacturing MCMs for defense applications.

Our Small Business Innovative Research Program (SBIR) also has supported several MCM efforts undertaken by our smaller contractors.

DOD's interest in this technology becomes clear when you see how MCMs and other highly integrated circuitry can both decrease costs and improve the performance of our military equipment.

I have just one other example here, our receivers for the Global Positioning System (GPS) which are becoming ubiquitous. In the middle to late 1980s, our procurement system and military specs led to the production of a single-channel manpack receiver, which weighed 17 pounds.

It would have had a cost of $20,000 in full-rate production. It, in fact, cost $35,000 in the early LRIP lots that we were producing in the hundreds.

At present, commercial off-the-shelf technology accounts for about 70 percent of GPS receiver design, mostly in the microprocessor and memory chips. Now, the possibility afforded by this dual-use technology, the MCMs, gives us the opportunity to evolve GPS receivers even further.

Motorola now produces a super-chip MCM design, which comes off a commercial production line. I have it right here. This is about an inch-and-a-quarter square single chip. I might pass that to you.

This chip is a six-channel GPS receiver. All it needs to make it work is a power supply, an antenna, a display, and an entry device. This unit in production will cost $400.

It is obviously smaller, cheaper, and it uses less power, and, in fact, the newest GPS Joint Program Office receiver initiative, called the Selective Availability/Anti-Spoofing Module, will be a full military GPS receiver using an MCM design.

The subject of dual-use technology would not be complete without a discussion of the TRP program. I share Secretary Perry's opinion about the importance of this program.

The TRP is a means to execute our strategy for developing dual-use technologies, and to integrate military production with a commercial industrial base.

I know that the TRP has come in for some criticism, and I would agree that our execution on the first round of this program was not perfect, but we have continued to improve and focus this program.

My policy has been and will continue to be that TRP projects must have defense utility and military application. I have a selfish interest here in seeing a return on investment in the Department.

I have been in my job for about seven months, so the TRP was not invented on my watch, but I must say that if it did not exist today, the TRP would be precisely the type of program that I would be trying to establish, to implement the Department's dual-use strategy.

I have just one last chart to illustrate this. The three pillars that I was describing are indicated here. They need a foundation of acquisition reform to be successful in integrating, in a dual-use sense, our commercial and industrial base.

The TRP spans all three pillars, and the unique aspects of the TRP in this program are three: one, that it involves cost-sharing in the program; two, that it is done entirely on a competitive basis; and three, that it has a set of very simple and flexible operating procedures which, in fact, go beyond where we are today in acquisition reform. All three are really key to a successful foundation.

In summary, Mr. Chairman, given DOD's new budget realities, and the amount of research being conducted in the commercial sector, we and the DOD must take a broader approach in technology development and utilization.

The examples I have used show how a dual-use strategy can improve the quality and reduce the cost of our military systems.

If we are to have assured and affordable access to the technologies needed for our future military systems, then we must reach out and exploit the technological advances being made in the commercial world. I believe the strategy I have outlined today is a prudent way to accomplish that goal.

Senator SMITH. Thank you, Mr. Secretary.

[The prepared statement of Dr. Kaminski follows:]

PREPARED STATEMENT BY HON. PAUL G. KAMINSKI, UNDER SECRETARY OF DEFENSE FOR ACQUISITION AND TECHNOLOGY

Mr. Chairman and members of the subcommittee, let me express my appreciation for the opportunity to discuss the Department of Defense dual-use technology programs and how they support the warfighter's needs.

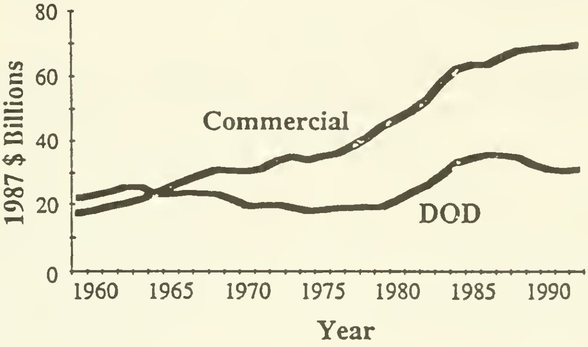
The Department's investment focus must transition to a broad modernization and recapitalization effort over the current fiscal years 1996–2001 Future Years Defense Program (FYDP). The objective of this effort is to preserve the decisive superiority of U.S. military forces and their weapon systems. However, suitable "technology ramps" must be in place before a robust modernization program can proceed. These ramps must be both relevant and feasible—relevant to the warfighter's future needs and aligned with the structure of our national industrial base. Both criteria are met by the Department's dual-use investment strategy.

Over the past 30 years, the evolutionary change in the industrial base that supports DOD is no less dramatic than the changes in the world order since the demise of the Soviet Union. While DOD purchases have declined, America's commercial markets have continued to expand. The rapid growth of the commercial industrial sector, driven by a commercial market flourishing quite independently of DOD, has reduced the once central role of defense spending as a driving force for innovation.

Chart 1 illustrates the R&D investment expenditures by DOD and private industry since the early 1960s. In aggregate terms, commercial industry surpassed the DOD in R&D spending back in 1965. The disparity between the DOD and commercial sector investment in R&D has been growing wider ever since. This difference means that relatively more of this Nation's technological momentum will be based on what's coming out of essentially commercial enterprises.

Chart 1

DOD and Commercial R&D Expenditures



The bottom line is that we have no choice but to move from separate industrial sectors for defense and commercial markets to an integrated national industrial base. Leveraging commercial technological advances to create military advantage is critical to ensuring that our equipment remains the most advanced in the world. The objective is to marry the momentum of a vigorous, productive, and competitive commercial industrial infrastructure with the unique technologies and systems integration capabilities provided by our defense contractors.

A tighter linkage with commercial markets can shorten the cycle time for weapon system development and reduce the cost of inserting technological improvements into DOD weapon systems. The Department of Defense cannot afford a 15-year acquisition cycle time when the comparable commercial turnover is every 34 years. The issue is not only cost. The lives of our soldiers, sailors, marines and airmen may depend upon shortened acquisition cycle times as well. In a global market, everyone, including our potential adversaries, will gain increasing access to the same commercial technology base. The military advantage goes to the nation who has the best cycle time to capture technologies that are commercially available; incorporate them in weapon systems; and get them fielded first.

DUAL-USE STRATEGY

The Department's dual-use investment strategy is documented in a February 1995 DOD report entitled *Dual Use Technology: A Defense Strategy for Affordable, Leading-Edge Technology*. This strategy builds on the Department's efforts to improve the defense acquisition process. Improved procurement business practices are the foundation for our efforts to establish an integrated defense-commercial industrial base. The Department's dual-use strategy contains three main pillars:

- Invest in dual-use technologies critical to military applications;
- Integrate military and commercial production;
- Insert commercial components into military systems.

The first pillar is leveraging the commercial sector's technology base investment. Commercial industry is now the technological agent of change in information systems, telecommunications and micro-electronics. The Department's dual-use technology program is tailored to leverage off the commercial technology base without having the taxpayer make the entire root investment.

The second pillar is the "dual produce" concept. The Department is putting a great deal of emphasis on taking advantage of commercial production to manufacture defense equipment. If we can produce weapon system platforms on commercial lines, it will be more the exception than the rule. However, there is great potential for doing this at the subsystem and critical component level of assembly.

The third piece of the strategy calls for DOD to make those investments that are needed to facilitate use of commercial components in defense systems. The objective is to have systems "designed for dual-use." This pillar recognizes that acquisition reform and dual-use technology investments are not, by themselves, sufficient to ensure use of commercial components. Program managers and contractors still face up-front costs and risks in adopting commercial products and technologies—for example, the cost of determining that a commercial integrated circuit will withstand the necessary extremes of temperature and humidity, or the cost of engineering a commercial component to fit an existing military system. Where it makes sense, DOD must offset those costs and risks at a level of organization that shares rather than duplicates common costs.

MULTI-CHIP MODULES

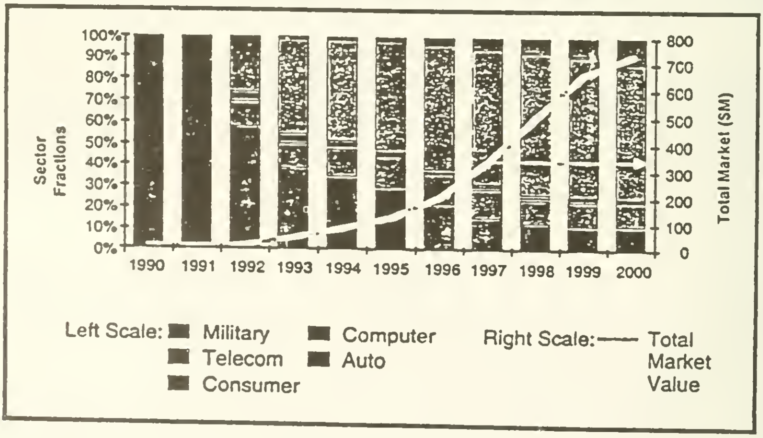
A good example of the implementation of the Department's dual-use strategy is DOD's investment in an electronic packaging technique—it is called Multi-Chip Modules or MCMs. MCMs take bare semiconductor chips, and rather than packaging each chip in its own individual package, places those bare chips in a tightly packed format on a single substrate integrated into a single package or module. This electronic module provides fundamental advantages in reduced size, increased performance, and improved reliability over a group of individually packaged chips.

DOD was the early leader in advancing this technology. We can expect MCM technology to find its way into more and more of our equipment. The advantages of MCMs are of critical importance in military applications like "smart" weapons and command and control systems. These advantages will also be important for future leadership in portable and mobile telecommunications and information processing for both the defense and commercial worlds. But, the primary factor now constraining more widespread usage is cost. Currently, MCMs are too expensive for many applications. The most promising way to reduce the cost is to greatly increase production volumes. Our studies show that we can expect unit costs to come down by a factor of 10 or more with large scale production.

Our strategy, shown in Chart 2, seems to be working. In 1990 and 1991, there was virtually no commercial market. But we have already seen significant growth in commercial applications, so that commercial applications today are over half of total sales. The Department's current projections are that the market demand for MCMs will grow to several hundred millions of dollars by the turn of the century. And by the turn of the century, the DOD percentage of that market will drop to about 10 percent of the total. As a result, the Department is able to buy off commercial MCM lines and capture savings in the prices DOD pays.

Chart 2

Multi-Chip Module Market Trends



The MCM effort pulls together all three pillars of our dual-use strategy-support for advanced R&D, support for the design and production infrastructure that will allow us to "dual produce" in commercial facilities, and support for the early insertion of MCMs into military systems where they can make a difference. It also illustrates how a variety of policy tools are used by the Department in implementing this strategy. ARPA's core R&D program has paid for much of the early R&D in this dual-use area. The Technology Reinvestment Project (TRP) is supporting several consortia which—with much of the cost shared with industry—are exploring different technical approaches to manufacturing of MCMs which can be used in Defense applications. Our Small Business Innovative Research (SBIR) program has supported several MCM efforts undertaken by our smaller contractors.

The advantages of MCMs are of critical importance in these military applications, and others, like "smart" weapons and command and control systems. An early application will be in the mast mounted sight in the OH–58 helicopter. The MCM is faster, more reliable, and requires less power, and yet it is much smaller than the portions of the circuit card it replaces. In the F–22, the MCM-based signal processing module will provide functionality that previously required three separate modules, in a vastly smaller footprint, with lower power consumption, and improved performance and reliability.

GLOBAL POSITIONING SYSTEM RECEIVERS

DOD's interest in this technology becomes clear when you see how MCMs and other highly integrated circuitry can both decrease the cost and improve the performance of military equipment. Take receivers for our Global Positioning System (GPS) as an example. In the mid-to-late 1980s, our procurement system and military specifications led to the production of a single-channel manpack receiver which weighed 17 pounds and would have cost about $20,000 in full-rate production quantities. But we never bought this receiver at full-rate because, under the previous constraints of doing business in the DOD, it was technologically obsolete by the time it was ready to produce.

Commercial industry was by then already building receivers such as this three-channel Trimble "Slugger" (Small, Lightweight GPS Receiver) which was as capable as the manpack, except for receiving military P-code signals, weighed about 7 pounds and cost about $2000. It was this receiver that the DOD bought in the early 1990s, in quantities of several thousand, for use by the ground forces in Desert Storm.

At the same time, the Army and Air Force, through the GPS Joint Program Office, embarked on a major initiative to leverage the technology investments made by commercial industry into military GPS equipment. Today, the results are these Rockwell-produced five-channel GPS receivers: a handheld unit, the "Plugger" (Precision Lightweight GPS Receiver) which weighs 4 pounds and costs less than $1000 and an embeddable unit on a card which weighs about a pound and costs about $10,000 but which, except for power, completely replaces a 12 pound military airborne receiver costing $25,000.

At present, Commercial Off-the-Shelf technology accounts for about 70 percent of GPS receiver design, mostly in microprocessor and memory chips. Now, the possibilities provided by MCM technology give us the opportunity to evolve GPS receivers even further. Motorola produces a super-chip MCM design which comes off a commercial production line. It is a six-channel, civil signal GPS receiver package which is expected to cost about $400 in production. The MCM is obviously smaller, cheaper, and uses less power than current designs. In fact, the newest GPS Joint Program Office receiver initiative, called the SAASM (Selective Availability/Anti-Spoofing Module) will be a full military GPS receiver in an MCM design. Through continuing initiatives by ARPA and the GPS Joint Program Office to rapidly apply commercially generated technology advances in military GPS equipment, we expect to continue driving performance up and costs down as we fully employ GPS across all the military services.

MONOLITHIC MICROWAVE INTEGRATED CIRCUITS

Another example of our dual-use strategy where results are now becoming visible is in microwave monolithic integrated circuits (MMICs). Microwave Monolithic Integrated Circuits or MMICs are solid state devices that receive, transmit, and process millimeter wave and microwave signals. MMIC technology is extremely important for radar and communications systems.

The radar in the F–22 advanced tactical aircraft uses about 2,000 MMIC transmit-receive modules. The initial cost for each module was $8,000, making the price tag for the radar alone about $16 million per plane. At that price, the radar would have added $7 billion to the total cost of the F–22 program.

In order to bring costs down, the Air Force and ARPA adopted a dual-use development strategy for the MMIC modules. As a result, a MMIC-based radar system that provides a collision avoidance warning to school busses was able to be developed and sold at a price of less than $2,000 each. More importantly, thanks in part to DOD investments in flexible production technology, the school bus module and the F–22 module are manufactured on the same production line. This means DOD will benefit directly from the economies of scale that will be realized if the system is successfully expanded to high-volume markets such as trucks and automobiles or to other application areas such as digital cellular telephones and spacecraft. Ultimately, with combined military and commercial production, the price is expected to drop to a few hundred dollars a piece, saving the U.S. Government several billion dollars on the F–22 program alone.

The MCM and MMIC cases show how pioneering development efforts by DOD led to technologies which were picked up by commercial firms and made affordable through volume production. Indeed, a similar story was played out with the original development of the integrated circuit and computer timesharing in the 1960s, and computer-assisted circuit design and advanced computer networking in the 1970s and 1980s.

HOLOGRAPHIC STORAGE DEVICES

At the present time, the government and industry are sharing technology development costs on ARPA's holographic data storage program. This program is managed by a government-industry consortium to develop next generation data storage technologies. These cost shared partnerships, a precursor to Technology Reinvestment Program (TRP), bring together a network of technical excellence in universities, defense industrial bases and commercial industrial bases, working toward a genetic or core technology base that meets the defense and commercial needs.

The growing capability of computing systems, combined with the ever increasing need to store and retrieve multivariate data sets of enormous proportions from distributed communication systems make holographic data storage systems extremely attractive for their large capacity (exceeding Tbits), short access times (on the order of 10–100 microseconds), large transfer rates (exceeding Gbits/sec) and ruggedness. Holographic data storage will have a major impact on National Defense in such areas as battle field data management, large image repositories, super computing, and airborne target recognition, including intelligence. In the industrial sector this technology will revolutionize mass storage applications involving large data sets, such as video on demand, data retrieval from libraries and image repositories on the National Information Infrastructure, as well as a host of consumer applications. The storage market alone is close to $100 billion per year.

TECHNOLOGY REINVESTMENT PROGRAM

These examples emphasize the point that the current dual-use strategy builds on a legacy of dual-use programs that have long brought benefit to DOD. Our new strategy is a comprehensive approach to improving the quality and reducing the cost of military systems, updated to respond to the twin transitions of needs and resources that we must now make as the Cold War ends.

The subject of dual-use technology would not be complete without a discussion of the Technology Reinvestment Project (TRP). I share Secretary Perry's opinion about the importance of this program. The TRP is a key part of our strategy to develop dual-use technologies and to integrate military production with the commercial industrial base. I know the TRP has come in for some criticism. Some have called it a conversion program or even considered it to be non-defense spending. My policy has been and will continue to be that TRP projects must have defense utility and military application.

One of the most important features of the TRP is the requirement for cost sharing. TRP projects allow us to enhance our military capabilities by leveraging the investments in research and development made by industry, bringing industrial creativity to bear on problems important to Defense.

For example, at a hearing on February 9, General Shalikashvili spoke about how situational awareness on the battlefield may revolutionize modern warfare. Yet many of the technologies needed to improve battlefield awareness, like communications satellites, high performance communications, microprocessors, and advanced flat panel displays are being developed or enhanced by primarily commercial firms. Unless we capitalize on the advances being made by these firms, the total battlefield awareness we seek will be more difficult and expensive to achieve.

I would like to address some individual projects that have been singled out for criticism. One involves the use of composite materials to construct bridges. Some have claimed that bridge building is not a vital defense technology. Despite the criticism, this particular project does have important military applications. The Army Corps of Engineers is a partner in the project because this technology may be used for tactical, mobile bridges which require minimal site preparation. A fast and easy technical solution to the problem of keeping our forces moving over obstacles and barriers is potentially of enormous military importance.

More broadly, composite materials are extremely important for defense, especially with regard to missiles and aircraft. Defense procurements have largely sustained the production base for composite materials in the past, but the industry has come under severe pressure as a result of lower procurement spending. Without an adequate base of composite manufacturers, high costs could put future aircraft and missile programs in jeopardy. Hence, the composite bridge program also seeks a way to sustain and expand the production base for composite manufacturers. If the project is successful and composite materials can be used for large structures like bridges, production volumes will increase and costs to DOD will come down accordingly.

The Power Electronic Building Blocks for Affordable High Performance Electric Power is another TRP project which has received some criticism. The objective of this effort is to develop high power switching devices having increased switching speed, higher current capability, and the ability to operate at lower temperatures. While these devices will improve power distribution for electric utilities, DOD will also get significant benefits as well. Each military service realizes how critical high power switching is becoming to advanced weapon systems. All three services cooperated on the project proposal and devices that are developed will be tested at laboratories of all three services. For example, the Navy will test applications for ship power supply, sonar power supplies and gun systems. Pulsed radar is another key application for these devices.

I have been in my job now about 7 months. So, the TRP was not really invented on my watch. But I must say, that if it did not exist today, the TRP would be precisely the type of program I would be trying to establish to implement the Department's Dual Use Strategy.

SUMMARY

Given DOD's new budget realities and the amount of research being conducted by commercial firms, we must take an innovative approach to technology development and utilization. The examples I've used show how the dual-use strategy is improving the quality and reducing the cost of military systems, while updating our response to the adjustments we need to make in a post Cold War world.

If we are to have assured and affordable access to the technologies needed for future military systems then we must reach out and exploit technological advances being made in the commercial world. I believe the strategy I've outlined here today is a prudent way to accomplish that goal.

Senator SMITH. Dr. Hermann.

STATEMENT OF ROBERT J. HERMANN, SENIOR VICE PRESIDENT FOR SCIENCE AND TECHNOLOGY, UNITED TECHNOLOGIES CORPORATION

Dr. HERMANN. Good afternoon. My name is Robert J. Hermann. I am the Senior Vice President for Science and Technology at the United Technologies Corporation.

My responsibility there is to assure the appropriate use of science and technology throughout the corporation. From time to time I give advice in an advisory capacity to the Government.

I hope I can be useful today in providing some views on the concept of dual-use and the Technology Reinvestment Program at the Department of Defense. I have a statement, which I would like to introduce for the record, and I will draw from it for a few opening remarks.

I will say a word or two about United Technologies, to lay a base. We are a multi-product enterprise of about 170,000 employees, which depends heavily on its technology positions, and generate about $21 billion in sales in almost every part of the world.

We may be better known by many of you by our product logos, which include the Pratt-Whitney jet engine company, Sikorsky Helicopters, Hamilton Standard Control Systems, Otis Elevator and Escalator Company, Carrier Heating, Ventilator, and Air-Conditioning Company, and United Technologies Automotive.

I go through that, because we are a global company, working a global marketplace, in a technology rich set of industries, and we participate in the defense program, but we are limited to—approximately 20 percent of revenues are drawn from the defense industry, to give a place from which my comments are derived.

When we examined the TRP program when it was first launched, and we were offered the opportunity to participate, we decided to compete with some specific ground-rules, but most importantly we would not propose on any activity that fell outside our key business objectives.

We needed to understand how we were going to exploit the resources that both we and the Government were putting on the program.

To win, we also had to show how the Department of Defense objectives were to be satisfied. By depending on the value from both objectives, we believed that both parties could achieve better value with less resources.

UTC operating units participated in 56 TRP proposals in the 1993–1994 program. UTC was on the winning team of eight of the TRP programs. I will briefly talk about the nature of them, because they are substantially different, by using three examples.

The first is the Affordable Composites for Propulsion program. This team involves our Pratt and Whitney unit, Boeing, Hercules, Vought, and several other organizations, including universities.

The objective of the program is to develop technologies for manufacturing composite parts for 30 percent less than it currently costs the U.S. military structure.

Our team is committed to this program, and we are making a direct investment of $150 million. The Government's investment will be in the order of $130 million over a 5-year program.

We are about a year into this program, and our technical progress is consistent with the plans that were made in preparation for the winning proposal.

Another program involves the development of an improved hydrostatic bearing. It involves improved rocket engines as well as air-conditioners.

This program brings together our Pratt and Whitney unit and our Carrier unit with the Air Force Phillips Lab, and demonstrates how technology developed under the TRP can be applied in both defense and consumer products, benefiting both the national and economic security of the nation.

A third example, United Technologies and many other industrial firms, universities, and State governments have established the Engineering Academy of Southern New England.

Its purpose is to combine the strengths of industry and academe to enhance manufacturing competence in the region. The financial support for this program is split evenly between the TRP program, State government, and local industry.

In trying to make a strategic assessment for you and for us of our role in the TRP program, I would offer these points for your consideration. First, I believe our company was stimulated into accelerating some things we might well have done eventually.

The fact of Department of Defense interest and TRP money caused us to modify our behavior to move more aggressively in our mutual interest.

Second, the breadth of our partnering is greater than it might have been had there not been a TRP. The policy and concept of bringing together defense and commercial activities, and the modification of the procurement ground rules, opened the opportunities for partnerships which we would not have thought natural to our activity prior to that opening.

But it is true, we would, in the normal course of events, have established and do establish strategic partners in both our defense and industrial affairs. The dynamics and the ground rules of this process encouraged a broader set of alliances. It is my own judgment that the linkage developed are a value to us and of value to the nation for both military and commercial purposes.

Let me say now a word or two about dual-use in national security, as I see it. The foundation of my judgment regarding dual-use is my conviction that the United States must draw the materials for its national security from an integrated industrial base.

As a member of the Defense Science Board, I have been chairing a DSB Task Force on Acquisition Reform for the past 2 years, and have developed a firm belief that we must move towards an integrated commercial and defense industrial base, and there are several reasons for this judgment.

The most important is that we will get better capability. For most areas of technology, as Dr. Kaminski has indicated, and by the way, industrial practice, the commercial sector is now the dominant driver of advances.

The competitive pressures there are intense, the financial stakes are substantially larger than for the defense market, and the global access to information has accelerated the proliferation of technology and industrial techniques.

This is particularly true for the critical areas of electronics and information systems. The commercial marketplace is moving much faster than the dedicated defense base that we have and creating the basis for far superior security systems, if we use it correctly.

The second major reason is cost. Many of these new electronic and information systems, as Paul has clearly indicated, are being created at much less cost than in the dedicated defense industrial sector, and are being assimilated into complete systems with much less cumbersome and expensive acquisition systems than are now in place in the Department of Defense.

Unless we change this, we are headed for a situation in which we pay a substantial premium for mediocre capabilities. We cannot now take advantage of this new industrial environment with our current system of acquisition.

Our processes are slow, expensive, and intrusive. Many commercial firms will not accept a Government contract, because of their intrusive, cost-based provisions.

In the new world, much of our security will depend on how well we can systematically exploit the technologies created in the commercial sector, and not just how well we create unique technologies proprietary to the Department of Defense.

I elaborate on this theme because I see it as at the heart of the argument for the TRP program. This set of trends has been working for many years, and as a result, there are currently many segments of the industrial base where the application of commercial practices and technologies could be advantageous to our defense needs, with some investment by Defense to tailor the outcome to our national security.

To be consistent with the concept of an integrated industrial base, these investments should also account for the likelihood that a commercially sound business will be in place as a future basis of supply.

The TRP process searches for these matches of sound future commercial businesses which could be adapted for defense purposes, and serves the dual purpose of furthering our security and our competitive interests.

I agree with those, and you, Mr. Chairman, who say that the Department of Defense should hold to its mission objectives, and not assume a new objective of national competitiveness, defense investment for defense return.

However, because we must create an environment where our security needs can be drawn from a healthy and advancing commercial industrial base, it is essential for Defense to use techniques such as the TRP to put our country in a position to exploit that position.

I see that purpose as central to the Department's mission objectives in establishing a base against which we draw our security needs.

That completes my oral statement. Thank you.

Senator SMITH. Thank you, Dr. Hermann.

[The prepared statement of Dr. Hermann follows:]

PREPARED STATEMENT BY DR. ROBERT J. HERMANN, SENIOR VICE PRESIDENT FOR SCIENCE AND TECHNOLOGY, UNITED TECHNOLOGIES CORPORATION

PERSPECTIVES ON DUAL-USE

Good afternoon, I am Dr. Robert J. Hermann, Senior Vice President for Science and Technology at the United Technologies Corporation. My responsibility is to assure the appropriate use of science and technology throughout the Corporation.

My purpose today is to provide some views on the concept of dual-use and the Technology Reinvestment Program at the Department of Defense. My remarks are organized into five segments.

First, I believe it is worthwhile to briefly review the profile of United Technologies as a context for our judgments on dual-use. The second segment will discuss UTC's participation in the TRP. I will then cover the role of dual-use as a part of our national security effort and in supporting U.S. competitiveness. Finally, I will touch on dual-use concepts and the role of Government.

A PROFILE OF UNITED TECHNOLOGIES

UTC provides a broad range of high-technology products and support services to the building systems, automotive, and aerospace industries. Our best known products include Pratt & Whitney military and commercial aircraft engines, Sikorsky helicopters, Hamilton Standard aerospace systems, Otis elevators and escalators, Carrier heating and air conditioning systems, and United Technologies Automotive components and systems. Several UTC units supply equipment and services to the U.S. Government—primarily to the Department of Defense and NASA.

At the end of 1994, UTC had 171,200 employees, including 95,200 outside of the United States. UTC is the Nation's 12th largest exporter. We are ranked 18th among the Fortune 500 companies and had 1994 sales of $21.2 billion with international revenues accounting for 54 percent of the total. UTC is established in all but six of the world's countries, giving it unique global presence.

UTC's aerospace units account for about 42 percent of total sales, and 58 percent come from its Otis, Carrier, and Automotive units. Sales to the U.S. Department of Defense and NASA in 1994 were $3.8 billion, or 18 percent of total sales.

Technology is key to UTC products. We conduct about $2 billion in research and development; half of that is conducted under contract to the government and we separately spend an additional $1 billion a year.

UTC PARTICIPATION IN THE TRP

When the TRP was offered for participation, UTC decided to compete with some specific ground rules. Most importantly, we would not propose on any activity that fell outside of our business objectives. We needed to understand how we were going to exploit the resources that both we and the Government were putting on the program. To win we also had to show how the Department of Defense objectives were to be satisfied. By depending on the value from both objectives, we believe that both parties could achieve better value with less resources.

There were areas of concern. One was how to deal with the intrusive Government procurement practices in companies which normally did their business with commercial practices and would be unable to accommodate that style of business. The original publicity from ARPA displayed a willingness to consider commercial practices and it was this assurance which helped us decide to participate in the TRP. Our current assessment of this aspect of the program is mixed. There has been more flexibility demonstrated but negotiating final agreements has been slow.

Another concern was the sustaining commitment of the Government. When we enter into a strategic arrangement such as this, we want to be able to count on the partner to sustain common objectives and mutual effort. Normally the contract activities we do for the Government are to achieve Government purposes only. In those instances, changes of Government direction affect the achievement of their objectives. When we are partners, changes of direction of either party affects the other. The constancy of Government purpose for the TRP was always a risk and I suppose one could say that our presence here today is related to our prior concern.

In the end, UTC operating units participation in 56 TRP proposals in the 1994 program. In some TRP proposals we assumed the lead role, while in others we were part of a large team. Our team members include, for example, the Boeing Company, AT&T, General Dynamics, IBM, General Motors, Ford, Dow Chemical, the States of Florida and Connecticut, State universities in both Florida and Connecticut, and many of the Federal labs.

UTC was on the winning team for eight of the TRP awards. These awards include our high priority "Affordable Composites for Propulsion" (ACP) program. This team involves our Pratt and Whitney unit, Boeing, Hercules, Vought, and Dow-UT. The objective of the program is to develop technologies for manufacturing composite parts for 30 percent less than what it costs the military today. The pay-off will be in the DOD's F–22 airframe and engine, JAST airframe and engine, E/F–18 airframe, and in the advanced military transport aircraft. For its dual-use or commercial application, we see this technology impacting positively on commercial airframes and engines. By developing these lower cost dual-use manufacturing technologies, we can sustain a composite infrastructure which provides a more affordable defense while enhancing U.S. manufacturing global competitiveness. Our team is committed to this program and we are making over a $150 million investment. The Government's investment will be on the order of $130 million over the 5 year program. We are about a year into this program and our technical success is well within plan.

Another of our TRP programs involve development of improved hydro-static bearings. This program brings together Pratt & Whitney and our Carrier unit with the Air Force Phillips Lab. The hydro-static bearing technology has a significant benefit to enhancing the performance of liquid rocket motors. The dual-use aspect of this program is improving the efficiency of our Carrier air-conditioning products. This program demonstrates how technology developed under the TRP can be applied in both strategic and consumer products benefiting both national and economic security of this Nation.

At another end of the spectrum, United Technologies and many other industrial firms, universities, and State governments have established the Engineering Academy of Southern New England. The purpose of this enterprise is to combine the strengths of industry and academe to enhance the manufacturing competence in this region. We know that more efficient manufacturing is a key to improved quality, cost and performance for both the military and commercial markets. We also know that increased emphasis on manufacturing in our engineering schools is needed to elevate the quality of process design to match our prior focus on product design. This academy involves sharing of information and resources among the land grant Universities of Connecticut, Massachusetts, and Rhode Island with participation in all aspects of the university education process by local industries. The financial support for this program is split evenly between the TRP program, State government, and local industry.

In trying to make a strategic assessment of our role in the TRP program, I would offer these points for your consideration. First, I believe our company was stimulated into accelerating some things we might well have done eventually. The fact of Department of Defense interest and TRP money caused us to modify our behavior to move more aggressive in our mutual interest. Second, the breadth or our partnering is greater than it might have been had there not been a TRP. While it is true that we work to establish strategic partners in the normal course of our commercial affairs, the dynamics of the TRP process encouraged a broader set of alliances. It is my own judgment that the linkages developed are of value for both military and commercial purposes.

DUAL-USE AND NATIONAL SECURITY

The foundation of my judgments regarding dual-use is my conviction that the United States must draw the materials for its national security from an integrated industrial base. As a member of the Defense Science Board, I have been chairing a DSB Task Force on Acquisition Reform for the past 2 years and have developed a firm belief that we must move toward an integrated commercial and defense industrial base. There are several reasons for this judgment:

The most important reason is that we will get better capabilities. For most areas of technology and industrial practice, the commercial sector is now the dominant driver of advances. The competitive pressures are intense, the financial stakes are substantially larger than for the Defense market, and global access to information has accelerated the proliferation of technology and industrial techniques. This is particularly true for the critical areas of electronics and information systems. The commercial market place is moving much faster than the dedicated defense base and creating the basis for far superior security systems.

The second major reason is cost. Many of these new electronics and information systems are being created at much less cost than in the dedicated defense industrial sector and are being assimilated into complete systems with much less cumbersome and expensive acquisition systems than are now in place in the Department of Defense. Unless we change this, we are headed for a situation in which we pay a substantial premium for mediocre capabilities.

We cannot now take advantage of this new industrial environment with our current system of acquisition. Our processes are slow, expensive, and intrusive. Many commercial firms will not accept a Government contract because of their intrusive, cost-based provisions. In the new world, much of our security will depend on how well we can systematically exploit the technologies created in the commercial sector and not just how well we create unique technologies proprietary to the United States.

I elaborate on this theme because I see it is at the heart of the argument for the TRP programs. This set of trends has been working for many years and, as a result, there are currently many segments of the industrial base where the application of commercial practices and technologies could be advantageous to our defense needs with some investment by Defense to tailor the outcome to our national security. To be consistent with the concept of an integrated industrial base, these investments should also account for the likelihood that a commercially sound business will be in place as a future basis of supply. The TRP processes search for these matches of sound future commercial businesses which could be adapted to defense purposes and serve the dual purpose of furthering our security and our competitiveness interests.

I am in sympathy with those who say that the Department of Defense should hold to its mission objectives and not assume a new objective of national competitiveness. However, because we must create an environment whereby our security needs can be drawn from a healthy and advancing commercial industrial base, it is essential for Defense to use techniques such as the TRP to put our country in a position to do so. I see that purpose as central to the departments' mission objectives.

DUAL-USE AND NATIONAL COMPETITIVENESS

I will restate my conviction that the Department of Defense should not assume a new role to assure the competitiveness of the United States. However, in order to draw our defense capabilities from a broadly based commercial industrial base, the department will need to understand what is available, revise its process for determining what to acquire. It will need to spend more on adapting what is available from the commercial base to its needs and less on specifying and acquiring unique and expensive systems. The investments made for this adaptation will be most effective if they also help sustain a healthy, and thus competitive, industrial base in the sector involved. In this way, some of our national security expenditures can be expected to contribute to our national competitiveness. This is an opportunity for adding value and should not be an argument for program cancellation. It would be unfortunate if we acted to prohibit this correspondence of objectives.

DUAL-USE AND THE ROLE OF GOVERNMENT

The Government is surely the appropriate agent for assuring the security of our Nation. We also believe in and depend on the Government as the correct institution to look out for the long-term needs of our society which include science, technology, education, business environment and infrastructure which define the basis for our continued survival and success. We in the private sector should be the primary engine for competitive industrial performance and the creation of preferred jobs and insuring value to our owners.

Let me conclude by saying that since our security in the future depends very directly on both, it is appropriate that we create instruments such as the TRP which require the combined judgment of Government and industry about security needs and competitive needs.

Thank you for your attention.

Senator SMITH. Mr. Cooper.

STATEMENT OF DAVID COOPER, DIRECTOR, ACQUISITION POLICY, TECHNOLOGY AND COMPETITIVENESS ISSUES, GENERAL ACCOUNTING OFFICE

Mr. COOPER. Mr. Chairman, members of the subcommittee, it is, indeed, a pleasure to be here today to talk about the work that we have done looking at the TRP. Clearly, the TRP is a very, very important part of the Department's strategy in the dual-use environment, and the work that we have done stems from two requirements.

First, we were mandated in the 1995 authorization act to evaluate the extent to which TRP projects further the national security objectives contained in the legislation that established the TRP.

The second requirement that our work stems from is a request by this subcommittee to look at specific projects, and we selected 11 projects to look at. I will discuss those in some detail further in the hearing.

What I would like to do, since the other witnesses have already talked about the value of the TRP and the dual-use strategy, is really get down to the details of what we tried to do.

Our review focused on determining how the TRP differs from other DOD dual-use programs, the military relevance of the selected TRP projects, and very important, how recent changes have really placed more emphasis on ensuring military relevance in the selection of future TRP projects.

Let me begin first with how the TRP differs from other dual-use programs. Like other dual-use programs, the TRP is designed to increase DOD's access to affordable leading-edge technology by leveraging commercial know-how, investments, and markets for military use.

The key difference we found between the TRP and other DOD dual-use programs is the emphasis that ARPA has placed on the commercial applications that stem from the dual-use TRP projects.

In the past, DOD was concerned primarily with the military applications of technologies, leaving subsequent commercial development of the technology to the private sector.

DOD, as the other witnesses have already talked about, is now emphasizing dual-use technologies, and, for example, in soliciting the 1993 projects, ARPA stated in the solicitation that evidence must be provided that the proposed technologies would be commercially sustained within 5 years, without further Federal funding.

TRP projects also differ from other ARPA and military service core dual-use programs, because, by statute, they must be competitively selected, include government-industry cost sharing, and involve industry-led partnerships.

The cost-sharing requirement is intended to ensure that the participating firms are interested in developing the commercial products from that technology.

In addition, TRP projects generally use special flexible agreements in lieu of traditional contracting instruments to help attract firms that might not otherwise want to deal with all the Government regulations and complexities.

Regarding the relevance of the TRP projects, in creating the TRP, the Congress established the policy that the national technology and industrial base be capable of meeting the following national security objectives: supplying and equipping the Armed Forces; sustaining production, maintenance, repair, and logistics for operations; maintaining advanced military research and development activities; and reconstituting a capability to develop and produce military supplies and equipment, including technologically advanced systems.

Congress further provided that the programs supporting these national security objectives promote a number of defense conversion objectives, including such things as economic growth and high-wage, high-technology industries, preserving the industrial and technical skill base, retraining displaced military, civilian, and defense industry personnel, and supporting State and local efforts aimed at defense reinvestment conversion, adjustment, and diversification.

In looking at the way ARPA solicited the 1993 programs, we found that they did not attempt to evaluate or solicit the TRP proposals specifically against the national security objectives contained in the legislation.

Rather, it solicited and evaluated proposals against these objectives in an aggregate manner. Accordingly, the TRP selection process, by itself, provides no way for us to determine direct linkages between the projects selected and any specific statutory objective.

Because ARPA did not evaluate those proposals against specific statutory objectives, we held many meetings with ARPA officials and people in the defense science and technology environment in order to come up with some kind of methodology to look at the 11 projects we selected, and to make some kind of call on whether those projects were militarily relevant.

The methodology that we finally came up with, as Dr. Kaminski previously alluded to, is a categorization of whether those projects have a direct benefit or an indirect benefit.

Based on some of the advice that we received from some of the technical experts at DOD, we defined direct benefits as those that met a specific military need, or would be involved with a specific weapons system, or the manufacture of that weapons system.

We categorized the projects as indirect if they contributed to a larger commercial base that would allow DOD to buy its goods and services in a more affordable manner, or whether those projects preserved a specific industrial base capability.

There are some projects that have an even more indirect benefit beyond that. I will talk about one of those in a moment.

A description of each of the 11 projects that we looked at is contained in my statement, and I will not take the time to go through those now. Based on our review of those 11 projects, what we did was to review all the documentation that was submitted by the firms involved in those projects.

We went out and visited the companies. We saw some of those technologies demonstrated. We had a lot of discussions with the ARPA project managers who are responsible for those programs, and also a lot of the people in the Office of Director for Defense Research and Development.

Based on all of the information that we collected in that endeavor, we classified six of the projects as clearly aimed at a military need, and five of those projects as indirectly aimed at meeting a military need.

I am not going to go through each one of those 11 now, but we can get into any or all of those in a question and answer session in just a minute.

The thing that I would like to emphasize, and I think it is at the heart of some of the debate that is going on involving whether we have military relevance or not, and that is that a number of changes have been recently made and directed by the Congress to ensure more emphasis on the military relevance of TRP projects in the future. I would like to just mention a few of those.

For example, in September, 1994, Congress mandated that the 1995 TRP funds not be obligated until the Secretary of Defense ensured that the service Assistant Secretaries for Research, Development, and Acquisition were full members of the Defense Technology and Conversion Council.

That is the oversight board that kind of administered the solicitation and awards of the TRP projects.

It also mandated that the services be fully involved in selecting technology focus areas for future TRP competitions, and be involved in evaluating those proposals that are selected for funding.

Just last month, the Congress added further conditions to ensure the military relevance. DOD is prohibited from obligating 1995 TRP funds until the Under Secretary of Defense for Acquisition and Technology certifies that representatives of the military services constitute a majority of the membership on the TRP selection panels, and the Under Secretary submits a report describing how each new TRP project or award meets a specific military need.

In response to these conditions, reduced funding for the 1995 program, and experience from the earlier TRP competitions, ARPA has made a number of changes to implement those kinds of conditions. We think those changes should go a long way toward ensuring more military relevance and ensuring that the military needs are met. That concludes my statement.

Senator SMITH. Thank you very much, Mr. Cooper.

[The prepared statement of Mr. Cooper follows:]

PREPARED STATEMENT BY DAVID E. COOPER, DIRECTOR, ACQUISITION POLICY, TECHNOLOGY AND COMPETITIVENESS ISSUES

Mr. Chairman and members of the subcommittee. It is a pleasure to be here today to discuss our work on the Technology Reinvestment Project, known as the TRP. The TRP is an important part of the Department of Defense's (DOD's) dual-use technology strategy, which seeks to maintain technologically superior U.S. military forces at an affordable cost.

With declining defense budgets and rapid advances in commercial technology, DOD considers its traditional approach to technology development and procurement to be less effective and affordable now than it was in the past. DOD believes it must now take advantage of cost-conscious, market-driven, commercial production and leverage the huge investments in leading-edge technologies made by private industry.

DOD's dual-use strategy reflects a significant change in the Department's procurement philosophy—to move away from reliance on specialized suppliers serving only the defense market and rely as much as possible on commercial suppliers. Thus, it is also an integral part of DOD's acquisition reform efforts.

GAO's work, undertaken at the request of this subcommittee, focused on:

- how the TRP differs from other DOD dual-use programs,
- the military relevance of selected TRP projects, and
- changes in the TRP to place more emphasis on military needs.

TRP DIFFERS FROM OTHER DOD DUAL-USE PROGRAMS

Like other dual-use programs, the TRP is designed to increase DOD's access to affordable, leading-edge technology by leveraging commercial know-how, investments, and markets for military use. The TRP has been managed by the Advanced Research Projects Agency (ARPA), in part because of the agency's larger commitment and experience with implementing a dual-use strategy. Over the last several years, for example, ARPA emphasized advanced computer technology with broad commercial applications, on the grounds that the military would be able to buy improved products at lower prices.

Because the TRP was conceived during a period of defense downsizing that emphasizes integrating defense firms into the commercial market, the key difference we found between it and other DOD dual-use programs is the emphasis that ARPA places on the ability of TRP technologies to result in commercial products that benefit DOD. In the past, DOD was concerned primarily with the military application of a technology, leaving subsequent commercial development of the technology to the private sector.

The approach that DOD is emphasizing now seeks to develop dual-use technologies in a way that actively promotes its development and use simultaneously in both sectors. In soliciting TRP projects for fiscal year 1993, ARPA stated that evidence must be provided that the proposed technology would be commercially sustained within 5 years, without further Federal funding.

TRP projects also differ from other ARPA and military service dual-use programs because, by statute, they must be competitively selected, include government-industry cost sharing, and involve industry-led partnerships. The cost-sharing requirement is intended to ensure that the participants are interested in developing products. In addition, TRP projects generally use special, flexible agreements in lieu of traditional contracting instruments to help attract firms that might not otherwise deal with the government.

RELEVANCE OF TRP PROJECTS TO MILITARY NEEDS

In creating the TRP, the Congress established a policy that the national technology and industrial base be capable of meeting the following national security objectives:[1]

— supplying and equipping the Armed Forces;

— sustaining production, maintenance, repair, and logistics for operations;

— maintaining advanced military research and development activities; and,

— reconstituting a capability to develop and produce military supplies and equipment, including technologically advanced systems.

Congress further provided that programs that support these objectives promote economic growth in high-wage, high technology industries and preserve the industrial and technical skill base; bolster the national technology base; retrain displaced military, civilian, and defense industry personnel; support State and local efforts aimed at defense reinvestment, conversion, adjustment, and diversification; and assist small business affected by defense spending reductions.

ARPA did not attempt to solicit and evaluate TRP proposals specifically against the national security objectives. Rather, it designed a program that solicited and evaluated proposals against these objectives in an aggregate manner. Accordingly, the TRP selection process provides no way to determine direct linkages between the projects selected and any specific statutory objective.

Because ARPA did not evaluate TRP proposals against specific statutory objectives, we evaluated a sample of TRP projects to determine whether they directly or indirectly meet military needs. We examined 11 randomly-selected projects. We reviewed project documentation, interviewed ARPA project managers, and visited companies involved in the projects. We also interviewed military service and DOD science and technology experts.

The 11 randomly-selected projects involved:

— light-weight, mobile, power generators,

— uncooled infrared sensors (used in night vision devices),

— computer simulations for surgical training,

— wearable computers to assist in manufacturing and maintenance operations,

— national health information network linking military and civilian sectors,

— a new gear design for helicopter transmissions,

— pyrotechnics emergency rescue equipment,

— technologies to enhance the competitiveness of the U.S. ship repair industry,

— specialized optics technology used in inspection systems to ensure high quality manufacturing,

— electronic commerce for DOD business applications, and

— preparing engineers for 21st century manufacturing.

A detailed description of each project is included in attachment I.

In analyzing these projects, we found that they had either direct or indirect benefits. If a project addressed a specific military need, including a weapon system or the manufacture of that system, the benefits are direct. If the project was intended to expand commercial markets to reduce the cost of DOD products, or preserve an element of the industrial base, the benefits are indirect. ARPA officials acknowledged that deployment and education projects, by their nature, indirectly benefit DOD.

Our review of the 11 projects revealed that six were clearly aimed at military needs while five were indirectly linked. (See attachment II)

An example of a project directly meeting a military need is the light-weight, mobile, power generator project. It is intended to be used in a variety of military roles such as (1) a system to support military operations in remote areas, (2) auxiliary power units for military vehicles like the Abrams tank, and (3) lightweight engines for reconnaissance vehicles.

Another project directly aimed at meeting military needs is the uncooled infrared sensors project that is intended to reduce manufacturing costs and leverage a commercial market for this technology and thereby allow broader use by U.S. troops. Current military sensors require cooling units that are too expensive to issue to those that may need them. With the development of a commercial market and the anticipated reductions in costs, infrared technology will be affordable for support vehicles and individual soldiers rather than being restricted to equipment like tanks and helicopters.

On the other hand, the emergency rescue equipment project indirectly meets defense needs by preserving work for a firm involved in military pyrotechnic work, an important element of the defense industrial base. With a reduced demand for space and defense pyrotechnics, this project was intended to demonstrate the commercial viability of using pyrotechnic technologies in commercial rescue equipment. However, as the project evolved, the firm decided to use a different technology in one of their commercial products and, as a result, the intended benefit of supporting pyrotechnics was decreased. Subsequently, ARPA reduced funding for the project by $254,000 in February 1995.

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[1] These statutory objectives are set out in 10 U.S.C. 2501.

Another project providing an indirect benefit is the electronic commerce project. It is intended to reduce transaction costs and lead-times. The Defense Logistics Agency is participating with the expectation that procurement cycles and costs will be reduced and supply options will be increased. Smaller defense firms will be able to respond to a greater number of solicitations thus becoming less dependent on prime contractors.

RECENT CHANGES PLACE MORE EMPHASIS ON MILITARY NEEDS

Because of the growing concerns about the defense relevance of TRP projects, the Congress required more involvement of the military services to ensure that ARPA, when selecting future TRP projects, places more emphasis on meeting military needs.

During selection of 1993 and 1994 TRP projects, the military services were not (1) represented on the Defense Technology Conversion Council, a multi-agency council responsible for conducting the TRP competitions, or (2) allowed to select the technology focus areas[2] used to solicit the TRP proposals.

In September 1994, Congress mandated (Public Law 103–335) that fiscal year 1995 TRP funds were not to be obligated until the Secretary of Defense ensured that:

— the service Assistant Secretaries for Research, Development, and Acquisition were full members of the Defense Technology and Conversion Council; and

— the services were fully involved in selecting focus areas and evaluating proposals for funding.

Last month, the Congress (in Public Law 104–6) added further conditions to ensure the military relevance of 1995 TRP projects. DOD is prohibited from obligating 1995 TRP funds until:

— the Under Secretary of Defense for Acquisition and Technology certifies to the Congress that representatives of the military services constituted a majority of the membership on TRP selection panels, and

— the Under Secretary submits a report to the Congress describing each new TRP project or award and the military needs which the project addresses.

In response to these conditions, reduced funding for 1995 projects, and experience from the earlier TRP competitions, ARPA has made a number of changes in the way it will manage the 1995 TRP competition. For example, the military service Assistant Secretaries, through senior science and technology official designees, are now represented on the Defense Technology Conversion Council. Further, ARPA is not soliciting technology deployment and manufacturing education and training projects because they were considered to be less defense relevant. Instead, ARPA will be soliciting technology development projects only. And, the number of focus areas has been reduced from 13 to 8. In 6 of the 8 focus areas, ARPA and military representatives have been paired to manage the projects.

Military service officials we interviewed believe these changes will help ensure that TRP projects are more focused on meeting military needs.

Mr. Chairman and members of the subcommittee, that concludes my statement. I will be pleased to answer any questions you have.

ATTACHMENT I

TRP PROJECTS EXAMINED

We randomly selected 11 TRP projects. Seven projects were selected from the 1993 technology development area, representing about 10 percent of the proposals funded in that area in 1993. Two additional technology development projects were selected from the fiscal year 1994 TRP competition. We also selected one project each from the technology deployment and manufacturing education and training areas.

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[2] Technology focus areas refer to broad areas identified as key dual-use technologies. Within these broad areas, specific topics are identified that are judged to meet critical defense needs as well as having significant potential to stimulate commercial product development.

Dollar figures shown in the following TRP project descriptions represent the total of government-industry cost sharing.

TECHNOLOGY DEVELOPMENT

"Power Pak" Mobile Electric Power System—This is a $1,460,675 project that will exploit emerging rotary engine and electromagnetic technologies using diesel fuel to achieve size, weight, safety, and logistic advantages over existing electric generation systems. The system's reduced size and weight should allow it to be used as: (1) a system to support operations in remote areas; (2) an auxiliary power unit for existing weapon systems like the Abrams tank; and (3) a light weight engine for reconnaissance vehicles.

Lockheed Martin Ordinance Systems is leading a partnership that includes two other commercial firms, two interested service organizations, one university, and one State government entity. Commercial applications for the project include power generation systems for recreational vehicles, homes in remote areas of the world, and back-up generators in hospitals and office buildings.

Uncooled Infrared Sensor Cost Reduction Program—This $11,520,670 project seeks to develop low cost, uncooled infrared sensors by reducing the manufacturing cost of such sensors and developing a commercial market for uncooled infrared sensor products. Military applications, which would be made possible through cost reductions and the affordability provided by the commercial market, include night driving aids, rifle scopes, perimeter surveillance systems, helmet-mounted night vision goggles, and mine detection devices.

Loral Infrared & Imaging Systems leads this partnership that includes six other commercial firms. The Army Night Vision Laboratory is the technical monitor. Potential commercial applications include industrial process and equipment surveillance, traffic monitoring, and equipment allowing firemen to see through smoke.

Surgical Simulation for Limb Trauma Management—This $1,211,787 project seeks to develop the first anatomically correct, three-dimensional computer visual model of a human limb for surgical training. Development of this technology will permit surgical training of medics and military physicians on battlefield-type wounds using simulation rather than animals.

MusculoGraphics, Inc. leads a partnership that includes another commercial business and the medical centers of two rehabilitation hospitals. This technology will be tested at the Fort Bragg Medical Training Center. Commercial applications beyond battlefield training include repairing knee ligaments.

Wearable Computer Systems with Transparent Head-mounted Displays for Manufacturing, Maintenance, and Training Applications—This $11,128,860 project will develop two types of wearable computer systems with headmounted displays for manufacturing, maintenance, and related training. The first type will have a position sensing system that superimposes images directly on surfaces such as engines or wire assembly boards. The second type projects text or images onto a miniature TV screen in eyeglasses and is expected to be useful where the user must be mobile, have free hands, and see technical data while performing a job. The military could use these systems in equipment maintenance and repair.

Boeing Computer Services leads this project that includes Honeywell and a university. McClellan Air Force Base will test this equipment in aircraft maintenance. In the civil sector, the partners expect the systems to be used by factory workers, aircraft mechanics, police, firefighters, warehouse workers, and medical professionals.

National Information Infrastructure for a Health Information Network—This $15.4 million project will design and develop a standardized medical emergency data system and its supporting systems to assist health care providers in quickly getting needed patient information. Compatibility between military and civilian health care systems would allow direct access to patient's health care records through networks so that information is available in both battlefield and civilian emergency care environments.

Rockwell International Corporation leads a consortium of 12 organizations that includes universities, health care groups, and other technology companies. Hospitals from Wright Patterson Air Force Base and Fort Gordon are also participating. Potential commercial products and services include data access and networking services, software analysis tools, and patient management systems.

Completion of Technology for Face Gearing Concept—This is a $1.5 million project to develop gears for transmissions that have teeth on their face rather their edges. The expected military benefit is principally on helicopters where projected savings include 40 percent weight reduction which would translate into increased payload or performance. The Army may use face gear technology for the Advanced Apache helicopter which is estimated to be fielded about 2010.

McDonnell Douglas Helicopter Company leads a partnership that includes another commercial firm, a university, and a DOD/NASA laboratory.

Pyrotechnic-Actuated Vehicle Rescue Equipment—This $1.6 million project was funded to develop existing space and defense pyrotechnic technology into emergency rescue equipment for rapidly freeing trapped victims of automobile collisions and collapsed structures. This equipment was to be lighter, more portable, and less expensive than current rescue equipment. According to project officials, the project benefits the defense industry by providing work for pyrotechnic experts and machine shops.

Hi-Shear Technology Corporation led the project which also included the City of Torrance Fire Department. In February 1995, the project's funding was reduced because of a decision by the firm to abandon use of pyrotechnic technology in developing one piece of the rescue equipment. During the project, Hi-Shear developed two metal cutting tools that it is currently manufacturing and selling. According to Hi-Shear officials, the potential commercial market for these tools consists of the 32,000 fire departments in the United States as well as those located in other countries.

Center for Advanced Ship Repair and Maintenance—The Center is a $2.4 million project that plans to develop technologies to enhance the competitiveness of the U.S. ship repair industry. Efforts are underway to develop: (1) a more cost effective and environmentally benign technology for stripping paint: (2) technologies to reduce fouling of seawater intake valves by biological organisms: and (3) a model for testing pollution in stormwater runoffs from dry docks.

Key project partners include the South Tidewater Association of Ship Repairers, the State of Virginia and city of Norfolk, and a university. Center officials believe that a market for paint stripping exists that has not been tapped by U.S. shipyards because of higher labor costs and more stringent environmental regulations. They also believe that a market exists for antifouling technology at shore facilities, such as powerplants.

Extrapolation of Adaptive Optics Technology to Manufacture of Electronics and Next Generation Information Display Systems—This $945,700 project uses optics technology developed for military surveillance applications to provide quality in the visual inspection and manufacturing of printed circuit boards and flat panel displays.

This project is led by AOI International and includes Optical Research Associates. Successful development of an inspection tool will reduce manufacturing costs of printed circuit boards and flat panel displays. The civilian market for flat panel displays is estimated at 20 times the military market.

TECHNOLOGY DEPLOYMENT

Smart Valley CommerceNet—This is a $12.0 million project to facilitate the use of an Internet-based marketplace for electronic commerce that would reduce transaction costs and lead-times. The Defense Logistics Agency is participating with the expectation that procurement cycles and costs will be reduced and supply options will be increased. Smaller defense firms will be able to respond to a greater number of solicitations thus becoming less dependent on prime contractors.

Project partners include Enterprise Integration Technologies Corporation, a university, and the Bay Area Regional Research Network. About 100 organizations currently participate in CommerceNet. CommerceNet is conducting several pilots addressing issues such as standards for security, connectivity, cataloging, and electronic data interchange.

MANUFACTURING EDUCATION AND TRAINING

Preparinq Engineers for Manufacturing in the 21st century—This is a $2.8 million project to introduce manufacturing education across the undergraduate engineering curriculum and provide practical experience in product design and manufacture on two national priority areas, new engineering materials and electronic devices and packaging. The Army Research Lab and the Army Materiel Systems Analysis Activity are involved in this project by participating in the development of the new curriculum and providing opportunities for students to be involved in military-related research.

The University of Maryland leads the project that includes Westinghouse, IBM, the Maryland Industrial Partnerships, and the Computer Aided Life Cycle Engineering Center, whose members include more than 20 defense-related electronic and aerospace firms. Participants expect significant increases in productivity by hiring students educated in the new manufacturing program.

ATTACHMENT II

CHARACTERIZATIONS OF DEFENSE-RELEVANCE FOR THE TRP PROJECTS

No.	Project	Direct	Indirect
1	Light-Weight, Mobile, Power Generators	X	
2	Uncooled Infrared Sensors	X	
3	Surgical Training Computer Simulation	X	
4	Wearable Computers	X	
5	National Health Information Network	X	
6	New Gear Design for Transmissions[1]	X	
7	Pyrotechnic Rescue Equipment[2]		X
8	Center for U.S. Ship Repair[3]		X
9	Specialized Optics Technology[4]		X
10	Electronic Commerce for DOD		X
11	Engineering Training		X

[1] According to DOD and project officials, the first likely use of this technology would not occur until the Army procures a new version of the Apache helicopter, probably around 2010.

[2] In February 1995, the project's funding was reduced because of a decision by the firm to abandon use of pyrotechnic technology in developing one piece of the rescue equipment.

[3] If a part of the project is to succeed, the Navy will have to change its specifications for paint removal. Current regulations do not allow using recyclable steel pellets for paint stripping, which this project is testing. In addition, the equipment being tested works best on flat surfaces of commercial ships and will need to be modified to address the unique contour of Navy ships.

[4] Technologies for producing advanced optics to make them less costly is of direct importance to meeting military requirements. The adaptive optics program provides an effective approach for enabling flexible production of complex lenses that are used in a wide range of defense sensing applications.

Senator SMITH. We will try a 6-minute round and see how that works.

Mr. Secretary, let me begin with you. In this program information package that you prepared for fiscal year 1995, you define relevance, defense relevance, as "a critical defense technology", and that is obvious, another definition would be if the technology makes defense capabilities more affordable.

I do not think anyone would quarrel with those two. But the third one is a little bit more subjective, "a significant improvement in health, safety, or environment, especially in manufacturing", is accomplished.

In the follow-up solicitation in this pamphlet here, you do not really make significant changes to clarify, although there are some strong words in there regarding defense relevance.

Could you try to clarify for me what exactly you mean by that third point?

Dr. KAMINSKI. I think that third point is a fairly broad point.

Senator SMITH. I noticed that. That is why I asked the question.

Dr. KAMINSKI. That selection criteria, however, stems from one of the statutes that underlies the technology development competitive area.

It is from the Defense Advanced Manufacturing Technology partnerships, 10 U.S. Code, 2522, which gives as one of the selection criteria, and I quote, "The extent to which the partnerships provide for the development of advanced manufacturing technologies usable for significantly reducing the potential health, safety, environmental hazards associated with existing manufacturing processes."

So it comes from the underlying legislation from the program.

I would comment, Mr. Chairman, that TRP, as it stands today, was folded together from four statutory programs, with somewhat different provisions. So we were sort of building the camel from this process to put it into one program.

My suggestion is that I think our program will be more focused, more narrow in its solicitation instructions, if we were operating only under a single statute.

Senator SMITH. Mr. Cooper, would that third point that I just asked the Secretary about, would that be one of the areas that you were referring to in your statement, your oral statement, where you indicated there was not total compliance with the statutory requirements?

Mr. COOPER. The one that I was specifically referring to, and I can discuss now, it does not fall necessarily in that environmental category or those other kinds of areas. The one that I was referring to is a commerce net project that has to do with electronic commerce.

I mean clearly it does not meet a military war-fighting need, but it does have an indirect benefit, because as you well know, with all the acquisition reform movement to have more efficiencies in the procurement process, there is a desire for the use of electronic commerce.

But whether the private sector would have pursued that technology or whether DOD needs to be a player in that, it is more on the indirect side of the scale than it would be on the direct.

Senator SMITH. But without getting into motive, because that is not the intention here, does not that type of language, though, invite (a) criticism, and (b) abuse within the system, to have language that broad, with very limited focus?

Dr. KAMINSKI. I personally would rather see much narrower language.

Senator SMITH. Mr. Secretary, do you have priorities within the dual-use programs in your own mind or in your agency's mind? Would you prioritize the TRP programs, if, in fact, there was to be a necessity to make some determination as to whether something should survive?

I am not asking you to do it here on the record, but do you, in your own mind, have some prioritization of these programs?

Dr. KAMINSKI. I think we do. We have the focus areas that comprise the TRP. Those can probably be put in some sense of priority. If the program were smaller, what I would end up doing is dropping some of those focus areas.

Senator SMITH. What about TRP relative to ARPA, where would you prioritize that?

Dr. KAMINSKI. I place a high priority on the TRP overall, for the reasons I stated—the freedom and arrangements to tie together all three of the pillars that I indicated.

The cost sharing is important to me, perhaps not so much so from the cost contribution that is provided, but is a test of seriousness, in terms of the commercial base and the commitment of a partner.

And I think the flexibility of the approach is a great model for where we ought to be heading overall with our acquisition of forum activities.

So each of those is important to me, Mr. Chairman. Overall, I believe the program is important.

Senator SMITH. Dr. Hermann, basically, there are two ends of the pipeline here. One is the research end and the other is what you do with the product at the other end, selling it somewhere.

Would it not be more beneficial to your industry to sell more airplane engines than it would be to have TRP money?

Dr. HERMANN. I think that we could imagine ways that you could benefit us that would be commensurate. I am not sure that I can quickly describe priorities which would exactly do it.

But if the question is, if the money that the Government is currently spending on TRP, if it was made available to us in some other way, could we reapply it in some better way, I would say yes, that is the case. We made the decision to invest in this with that in mind.

The only other thing I would say, as a corporate citizen of the United States, we actually take seriously the notion that we are working here in the interest of the national security as well as the interest of the fiduciary responsibility we have as a corporation.

I think we actually need to keep both of those in mind, and I think there are ways in which we could reallocate resources under a lot of different strategies.

This strategy is not a bad one, and we are acting selfishly when we bid on it, so that we can maximize the use of both our resources and Government's.

It is a very serious decision, because the amount of money that we are putting down as a partnership is a large amount of money.

Senator SMITH. My last question, before I turn it over to Senator Bingaman, just as a follow-up on that point, would it be fair to say, though, that TRP money helps you on the margins, and selling airplane engines is core? Is that a fair statement?

Dr. HERMANN. I would not let you—let me restate this statement. I am not sure that I want to answer yes to that. And the reason is, is that, particularly in the aircraft engine game, what we are doing with the Government is advancing the state of the composite art.

The thing that we would not have, let us say, a year-and-a-half ago, when we were approaching this decision, the issue is, is there a market clear enough defined so that we know now to commit this level of resources to preparation for a different kind of engine-using device. And we are going to do that, and we are going to do that for the selfish purpose of selling engines.

The phenomenon of the event of the TRP caused us to behave in such a way that we saw a way to accelerate our interests. So I am having trouble separating that into TRP money or selling engines.

And the way in which we made the decision, we are using TRP money to improve our position to respond both to the defense marketplace, which is also selling engines, and to the commercial marketplace, which is selling engines. Have we communicated?

Senator SMITH. All right. I hear you. Senator Bingaman.

Senator BINGAMAN. Thank you very much, Mr. Chairman.

As I listened to the little excerpt that Senator Smith read from Senator McCain's prepared statement, he said, as I understood it, that the test of whether the Pentagon should invest in a particular research area was whether, I believe this is right, the preponderance of the application of the technology is defense related.

I guess I would like to ask you, Secretary Kaminski, it strikes me that if that test were applied literally, you really would not be able to invest in much of anything that has a commercial application.

The example that you showed with your chart of multi-chip modules, the defense application of that technology is, by definition, just given the size of the defense needs, and the size of the world market, it is necessarily going to be substantially less than the commercial application of that technology.

It strikes me that the better test is not whether or not the defense application is going to be the predominant application, the better test would be whether or not the technology that is being invested in is, in fact, critical to accomplishing your defense objectives. I would be anxious to get your thoughts on that.

Dr. KAMINSKI. I agree with that, Senator Bingaman. The word in the statement which was bothering me was the preponderance word.

I do not think it should matter to the department whether or not the preponderant benefit comes to the department. It is just fine for there to be a wonderful commercial payoff, so far as I am concerned, so long as the return to the department, in terms of what we will get for the investment passes our relevance and interest test.

So if we help set up a wonderful commercial venture by being a partner in an investment, that is just fine for me, so long as there is a payoff from that for the DOD.

Senator BINGAMAN. Just to cite a couple of other examples of what I am concerned about here is jet engines.

I assume that there is some benefit—when you develop technology to improve a jet engine—there is a commercial application which may exceed the defense application. That does not mean it is not valuable for the department to invest in. I guess that would be another example.

Dr. KAMINSKI. That would be another good example, from my perspective. There is a benefit for the department there, even though the number of engines produced for commercial applications might be far larger than the——

Senator BINGAMAN. Just thinking back to Admiral Owens' testimony about how our abilities in having this dominant battlefield awareness capability will depend upon information technology almost exclusively, on various developments in that area.

I guess that if we were to apply a dominant or a pre-dominant test, such as Senator McCain suggested, we would be in a situation where we could not use defense dollars to invest in those technologies we are going to need to maintain dominant battlefield awareness.

I would just ask for the record whether you agree that that is another example.

Dr. KAMINSKI. I would agree, that is another example.

Senator BINGAMAN. Let me move to a question about Section 23.71 of Title 10, of the public law. This gives ARPA and the various military services so-called other transactions authority to carry out the cost-shared technology partnerships with industry.

ARPA has used this authority vigorously. The military services have been slow to use this flexible authority. Can you explain or elaborate your thoughts as to why they have been reluctant to move ahead in this area? It seems to us that in passing that legislation, we thought it was something which would be of great value to all of the services.

Dr. KAMINSKI. I think they have been slow to use it, Senator Bingaman, for three reasons. One is that it has not been widely known in the services. I have given some attention to making it more widely known.

Two is that it really has not been propagated down into the acquisition system very deeply. Three is that our whole acquisition infrastructure tends to be very conservative, and to use the tried and true means that it had been well tested, and has minimal risk. So that tends to discourage the system from trying new things.

Senator BINGAMAN. When we set that up, I think we set it up on a 3-year authorization, the pilot authorization. Is it your thought that we should make this authority permanent, and extend it—I am sorry, I am now asking about section 845—should we extend that to other services, and make it permanent as well? Did you have an opinion on that?

Dr. KAMINSKI. Were you referring there to the other agreement authority?

Senator BINGAMAN. Yes, I was.

Dr. KAMINSKI. Yes. I would be supportive of broadening that base. I think it has a number of flexible tools, which have to be used with reason, but I think we can take advantage of it.

Senator BINGAMAN. Okay. Mr. Cooper, let me ask you a question. One of the things which has been bandied about in some of the critiques about the TRP, I have not heard it in recent months, but at some stages there were allegations that although the selection of these projects to be funded under TRP was supposed to be merit-based; in fact, there were political considerations in the choice of who actually got the funding.

Did you find any evidence to support that in any of your analysis? Do you have any reason to believe that that is the case?

Mr. COOPER. No, Senator. We have looked at the selection process in some detail, looking at the panel scores, and the evaluations, and everything that we can tell, from what we have looked at, it is strictly based on merit. We do not see any political influence in the process.

Senator BINGAMAN. I will stop with that, Mr. Chairman. Thank you.

Senator SMITH. That is a good place to stop. [Laughter.]

Senator Lieberman.

Senator LIEBERMAN. Thank you, Mr. Chairman.

I was just thinking, as I was sitting here, I was in a hearing yesterday morning, which the Chairman was in, too, about submarines, and it was quite heated and contested. This is a pretty quiet hearing by comparison.

I say that in one measure, as an expression of gratitude, but also, not to diminish the importance of the hearing yesterday, but to say that sometimes in the quiet, less attended hearings held on afternoons like this, we really do make judgments that determine the future of our security.

We all know that some of these dual-use programs are under attack now in this Congress. I feel so strongly about the connection between the dual-use technology investments in programs like TRP, and military modernization, and our national security, that I have to believe that those who are attacking these programs do not fully understand them, I say respectfully, that they have not been educated, if I can put it that way, to the connection between these programs and our future national security. I hope that this subcommittee can play some role in educating, because what we are talking about here is the classic distinction that we in Government have, private businesses have, between the obvious needs of the moment, and the less visible impact of investing for the longer term.

We always talk in this committee of the distinction between readiness and modernization, and these programs are part of modernization.

The truth is that modernization is tomorrow's readiness, particularly—well, I guess we have all been influenced by the Ed Malones, and Mr. Marshall over at the Pentagon, and others who are not only documenting, but projecting the impact of the technological revolution on warfare.

If we are not at the head of that revolution in this country, we are not going to be as secure as we should be. And that is what these programs are all about.

I want to ask this question. In the past we have had the luxury of having basically stand-alone defense technology programs, because we could afford them.

In one sense, your multi-chip module chart appears to be one of the many examples where investments in defense technology spawned enormous developments in commercial technology. Now, the opposite is happening. Now, the civilian sector is way ahead in technology development. Here is one of the concerns that I have, and one of the reasons why I think that these dual-use programs are so important.

Once you are dealing with technology developed by the civilian sector, potential enemies of ours, I cannot think of a better term, have the same access to the technology that we do.

Correct me if I am wrong, but it seems to me that one of the advantages of these programs, TRP and dual-use, is that it not only allows us to leverage on civilian commercial dollars that are being invested, but it allows us to develop the military applications before some of the other countries in the world can. Am I right about that?

They can buy it off the shelf just like we can. With dual-use technologies, we still have a head start, a bit of a margin, because of the dual-use programs.

Secretary Kaminski, is that the case?

Dr. KAMINSKI. Yes. I agree, Senator Lieberman. There is an aspect here of transitioning this technology. We have a whole culture to change in the Defense Department, in our laboratory infrastructure, and other elements.

It is harder to watch what somebody else is doing, and pick up the good features, and leverage it to your own use, than it is if you have all the resources required to develop everything you need.

Senator LIEBERMAN. Right.

Dr. KAMINSKI. We would rather be in that mode of being lazy, and have all the resources to develop everything we need. We need to change the culture to be more in the mode of monitoring what is happening in some of the commercial technology developments.

We still have to spend the resources to bring the system integration, the system engineering glue, into defense applications.

But I think honing those skills is going to be very important for us as we apply what is being developed in the commercial sector, and the cycle time of that application is going to be very important in this global competition, in terms of reducing that for our Armed Forces, when the root technology is available to adversaries as well as to us.

Senator LIEBERMAN. Tell me a little bit about, what is the time frame for the development process to get a technology from conception of the idea, and funding of the project, to getting the technology actually in the hands of the military?

Dr. KAMINSKI. A typical cycle time for that kind of process in the DOD has been 15 years. The commercial turnaround, the commercial cycle time equivalent, is about 3 or 4 years.

Now, this varies a great deal by application. That commercial time is probably more representative of the electronics industry, whereas the number I have given you for defense is for a large and complete system.

But we still have to be in our large and complete system mode, having the means to update, and inject what is happening in shorter commercial cycles.

Senator LIEBERMAN. Right. Give me an example. I will give you some examples, and give me some sense of the time frame.

For instance, the multi-chip modules, or the global positioning system receivers that you talked about, what kind of time frame is involved?

Dr. KAMINSKI. If you looked at that chart on MCMs, it was about a 10-year period for the commercial market to build to its peak. And that involves investment in means of production to broaden the base.

That is a description of the time for the market to develop and reach its potential, if it is actually being embedded into commercial products with cycle times that in some cases might be 18 months or less. So I see MCMs going into advanced computer systems.

Senator LIEBERMAN. Dr. Hermann, let me ask you this question. In your statement you pointed out that UTC does not pursue any project, understandably, that is not important both to UTC and to the national defense.

What would happen if the Government did not participate in funding such research? In other words, since you say that you would not pursue projects that were not of importance anyway to UTC, why would you not pursue them independently, without the governmental support?

Dr. HERMANN. Well, using the advanced composite program, the jet engine, as an example, we would come to a different calculus of when to do that, based exclusively on our assessment of where the commercial and military market might be on our volition; that is, with our investment, we would get our return against our estimate of what the market was like in an aggregated way between defense and commercial, and in that case, the big driver would be the commercial sector.

Now, Dr. Kaminski comes along and said, I think, that there is advantage to defense for creating a technology and industrial base that could serve defense, from a commercial industrial base, of an improved means of jet engine by composites.

And he says it is a value to him, separately from the value to me. And we get together and say I will put this much on the table and you put this much on the table, that causes our calculus to change. It indicates there may actually be a market earlier than we might have otherwise suggested.

Senator LIEBERMAN. Right.

Dr. HERMANN. He is bringing a focus and attention to it that permits us to help focus our own efforts, and he has made it possible for us to have partners under a different set of ground-rules, which are more flexible than existed before.

So if he had come and said I will give you a dedicated slice of money to do something particularly for the Government, we would have had a different program.

But the reason I would argue that you have to assess each one at the time is that it is a business strategy for both participants.

That is what his business strategy and what is our business strategy, and if we both have value, and can see mutual advantage and mutual execution, then that is the way we would calculate it.

Senator LIEBERMAN. That is a helpful answer. My time is up, but it sounds to me like what you are saying is that these are areas in which you might well invest, but the timing of that investment is affected by the decisions that DOD makes in these programs to suggest to you that there is a market, and a market that may be more——

Dr. HERMANN. Right. And in a business strategy on both sides, since I have had some experience on both sides.

Senator LIEBERMAN. Right.

Dr. HERMANN. There is a great merit in giving yourself a quicker option, that is, an option to execute, so that from our point of view, we are in a better position as a company to execute a composite engine, because we have taken the effort to get to a better position to act.

And in some sense, that is exactly what the Defense Department is doing as well, they are putting themselves in the position where they could shorten the cycle to market, in their sense, by having laid in place the ability to make a decision and shorten that cycle.

Senator LIEBERMAN. Okay. My time is up. Thank you.

Senator SMITH. Thank you, Senator Lieberman.

Mr. Cooper, in the GAO review that you cited, you indicated you had looked at eleven projects, and I think you said, correct me if I am wrong, I think you said six had direct military relevance, and five, I think you said, had indirect relevance.

Did you look further into that to make any decision or determination as to whether these projects should be continued?

Mr. COOPER. No. We did not go that far as to determine what was coming out of the project, or whether they needed to be continued. We did look at the need for funding for the projects awarded in 1993 and 1994, and what kind of budgetary impact they would have in 1996.

If you continue those projects awarded and exercise the options for those projects, ARPA is going to need about $170 million or so to keep those projects going.

Senator SMITH. Would you recommend any of the 11 that you looked at for termination?

Mr. COOPER. No, we would not. I might just add, one of the projects we did look at, ARPA made the decision to terminate a portion of it, once they determined that the technology that was evolving from that project really was not going to benefit——

Senator SMITH. That is exactly what I am getting at. You put it a better way than I asked it. Were there cases where you did determine that as the technology evolved, we realized that it was not——

Mr. COOPER. Right.

Senator SMITH. As essential as thought?

Mr. COOPER. Right. The project that I am referring to is a pyrotechnic rescue equipment project that was funded. It was funded, because it was designed to preserve some of the firms that were not getting a lot of work in pyrotechnics.

Since that is a critical or important part of the defense industrial base, that project was designed to keep work going to those firms.

However, as that technology or project evolved, the firm involved in the project decided that they would use another technology, unrelated to pyrotechnics, and as a result, ARPA withdrew the funding for that part of the project.

Senator SMITH. Let me ask you one more question in the area of in-kind versus cash contributions in these projects. As you have studied this process, and looked at these projects, have you followed to any degree, or come to any conclusions regarding the non-federal participants, as to whether they are meeting their original cost-sharing requirements under the statute, when we compare cash versus in-kind?

Mr. COOPER. I think the issue that you are getting at, Mr. Chairman, are the sharing arrangements under the TRP projects.

We are primarily talking about those projects that use the other transaction instruments. It is the special, flexible kinds of arrangements between the Government and the industry participants.

The cost sharing can be either cash or it can be IR&D funding that the Government reimburses a portion of to the companies.

It can involve intellectual property rights, and involve the cost of facilities for those companies, travel costs for those companies, salaries of their employees, all those things that are kind of wrapped up as their share in the cost arrangement.

We did not find any case where those companies are not fulfilling their commitment under those agreements.

Senator SMITH. All right.

Dr. Hermann, you described one of the benefits of TRP for United Technologies as the breadth of the partnering with other players.

What is it about the TRP selection, being a part of the TRP process, that drives you in the direction of research any more than standard R&D research?

Dr. HERMANN. I would say one major thing and one peripheral thing. The major thing is the opening up of the procurement process, the other transactions, the aspects of it to permit the commingling of defense and commercial industries in a partnership under rules of cooperation with the Government that are not as—not the same as a regular—a normal Government compliance procurement.

So having opened that up, it permitted the participation and a partnering with people who would basically not choose to participate in a Government program. So I would say that that is an opening that occurred.

And I would say the atmosphere around the TRP encouraged partnerships and encouraged, particularly, universities. If I were a strategist for winning a TRP proposal, I would probably make sure that I had a good university or two in there, and as a result, I would say the dynamics caused some engagement of universities, for example, in a way that I think would not have been as liberal.

I think it is not a very defined point, in that we actually do all of those things without the aid of a TRP, but it is my judgment that it was a richer mix for the TRP program.

Senator SMITH. Secretary Kaminski, would you agree with—the cost-sharing in-kind versus cash, do you agree with his conclusions?

Dr. KAMINSKI. Yes, sir. I look at the cost sharing arrangements, it tells us that they are generally working well. We monitor the performance on milestones and accomplishments. If they are not being accomplished, we do not pay our piece of the program.

Senator SMITH. I know this is a terrible question for you to answer, but do you have any threshold in mind, we are looking at roughly $500 million in programming.

We have advocates out there basically lining the program out, which I do not think the ranking member or I am in that particular category, as you probably are well aware, but I think that given the fact that this is out there, is there some threshold whereby if it is $200 million, you cannot function, if it is $300 million, or $100 million?

Is there some point where if it is not funded at a certain level, it just does not pay to have it?

Dr. KAMINSKI. I would start off, of course, by arguing for the full program that is in the President's budget, $500 million. Let me tell you how that would be used.

About $235 million of that really would come forward for due bills and options from the previous competitions, if you wanted to——

Senator SMITH. How much is that?

Dr. KAMINSKI. $235 million. So that leaves $265 million or so that could be used for the technology development competition. Now, this is roughly the size of the first technology development competition.

If that starts to get reduced, there gets to be a level about where it is not sensible to put in all that non-recurring effort to undertake this kind of a competition, and that is somewhere in the range of, I do not know, $175 million, $150 million, maybe, at the bottom. So below that level, we probably would not undertake to do it.

Senator SMITH. That is a very honest answer, and I appreciate it. It is easy in any program to say well, we will take half of it, or a third of it, or whatever. I think you should be prepared to look into the individual contractual relationships that we have. We may need that kind of feedback if we get hit pretty hard here, just as a kind of heads up.

I do not know what is coming. But I have heard some members refer to this as the cash cow subcommittee. That is usually not a good sign. [Laughter.]

Senator Bingaman, do you have any further questions?

Senator BINGAMAN. I agree. That is not a good sign. Let me just clarify what I think has been implicit in several of the statements made.

Mr. Cooper, you broke these 11 projects that you looked at into those that were directly relevant to defense and those that were indirectly relevant.

As I understand it, the overall TRP had different categories in it. There is the technology development category, there is also the deployment category, and there is the education category.

Am I correct in believing that the ones that you identified, of these 11, the ones that you identified as being only indirectly relevant to defense are, in fact, in the deployment or education categories, rather than the technology development category?

Mr. COOPER. Nine of the projects that we selected were in the technology and development category, and the six that we felt were directly relevant fell in there. So there were still three of those that appeared more on the indirect side.

Your comment is very accurate. We selected one deployment project, and that is in the indirect category, and we selected one education and training project, and that is also indirect.

As a matter of fact, in our discussions with ARPA officials, they clearly put the deployment and the training education projects in that kind of indirect category.

Senator BINGAMAN. Well, my understanding is that the deployment category now has gone over to the Commerce Department. At least there has been some general agreement that that would happen.

Maybe this is a question that Secretary Kaminski—as I understand it, DOD has decided, made a determination to focus TRP funding on the technology development from now on, so that if new funds are provided to you, in sufficient quantity for you to have another competition, it will be in the technology development category that you have——

Dr. KAMINSKI. That is correct, Senator, that is——

Senator BINGAMAN. And that was a decision that you made in order to ensure the military application more directly, is that correct?

Dr. KAMINSKI. Yes, sir.

Senator BINGAMAN. Okay. Dr. Hermann, let me just ask you, I think in my opening statement I made reference to the fact that it seemed to me that the general thrust we should be moving in is not to do less dual-use funding, but, in fact, we should be moving to do more dual-use funding.

One area that we provide some funds in is manufacturing technology. Would you agree that when DOD funds a man-tech project that has commercial value, we ought to try to get a cost-shared arrangement, just as we get a cost-shared arrangement in these technology development areas?

Dr. HERMANN. Yes.

Senator BINGAMAN. Okay. That is something, Mr. Chairman, I hope we can look at in this year's bill. I have been of the view for a long time that in more and more of these areas, where there is clearly a commercial benefit, we ought to try to work toward cost-shared arrangements. I appreciate that——

Dr. HERMANN. If we are going to—both Dr. Kaminski and I have testified, if we are going to depend heavily on the commercial sector for technology and industrial capacity, then we have to learn how to value the business objectives of both the defense establishment and the commercial sector, and find ways so that we can both defray each other's expenses and profit as a result on both sides.

Senator BINGAMAN. I think what we are in danger of in this area as well as all other areas is that it strikes me that we are in this perverse situation, I commented on the other day, where, if DOD funds 100 percent, everyone says, well, that is fine, because that is defense. If DOD funds less than 100 percent, various people jump up and say this is corporate welfare. I just——

Dr. KAMINSKI. Keep after them, sir.

Senator BINGAMAN. Okay. [Laughter.]

We may need an affidavit from you that that is not corporate welfare, sir, later on. That is all I have, Mr. Chairman. Thank you very much.

Senator SMITH. I just have one final point. Dr. Herman, you might be able to answer it specifically for your company, and Mr. Secretary, maybe you can answer it in a generic way.

One of the problems with TRP is that it is a new program, and we really have not had a chance to see the results long term, or really short-term results. Is there any period on the horizon when we could hope to see something very positive that we could use to deflect some of the criticism here?

Dr. KAMINSKI. I have a few examples. It depends on what the measure is here. If I use the measure of a military payoff that I can demonstrate from some of the things that have come out of the early rounds, there are three things I can note today.

One is a low-cost miniature safe-arm device being tested by the Army that I see an application for. It is working, and has good promise.

Another is in the work of trauma care technology, developed under the TRP. That has been successfully demonstrated by the services, and I expect we will use it.

And the third is a set of machinery, a turbo alternator demonstrated by the Army as an auxiliary power unit on the M1A1 tank. Those are three.

Senator SMITH. If you have further details on those or any other such programs prior to—as we get into the hard deliberative process on the budget, it would be helpful if we could have as much of that information as you could——

Dr. HERMANN. I do not think I can advertise it in the programs that we are involved in, and you should wait for pieces of hardware employed in the field very early as a result of this investment.

On the other hand, I would want to say that the game is not only played there, and that is, at the moment, Dr. Kaminski and the department have already assured themselves an efficient hedge against earlier application of jet engine capability than they would have had they not had this in place.

I will say that, because the strategy value placed by the department says that is what they wish to do, and the execution of the program is going well. All I am saying is that before one can evaluate what is going on, you actually have to understand what strategy element you are filling.

I would say in this case, we are doing that demonstrably. I recognize the political tangibility of that is softer than some, but the strategic importance is at least as important as being able to bring a piece of hardware to the table.

Senator SMITH. I want to thank the witnesses very much for the very fine, candid testimony. We appreciate it.

I will leave the record open until May 25 for any Senator who may wish to submit questions in writing, and give another week, until June 1, to respond, if you do get such questions.

Senator SMITH. The hearing is adjourned.

[Questions for the record with answers suppled follow:]

QUESTIONS SUBMITTED BY SENATOR BOB SMITH

Senator SMITH. Dr. Kaminski, one of the difficulties we face is identifying which programs constitute the so-called core ARPA dual-use programs in our review of the 1996 budget request. On page 10 of the February 1995 Dual-use Strategy, there is a chart with specific dollar allocations but no program names or numbers. Can you provide now or for the record a detailed listing of the programs or portions of the programs that make up the $1.9 billion total of the request?

Dr. KAMINSKI. The following table provides the requested breakout of ARPA dual-use program funding. It should be noted that the rescissions in the Fiscal Year 1995 Emergency Supplemental Act have not been reflected.

[Dollars in millions]

Program	Fiscal year	
	1995	1996
Information Technology:		
Information Sciences	$23.9	$24.8
Intelligence System/Software	76.0	96.3
High Performance Computing	241.2	234.6
Defensive Information Warfare	10.0	35.0
Software Engineering	40.4	19.2
Information Tech Subtotal	391.5	409.9
Advanced Materials:		
Materials Sciences	28.5	22.4
Metal Matrix and Ceramics	18.8	—
Diamond Substrate MCM	5.5	—
Materials Processing	79.9	63.7
Optoelectronics	21.9	22.6
Electronics Processing	71.0	39.6
Cryoelectronics	—	8.0

[Dollars in millions]

Program	Fiscal year	
	1995	1996
Joint Emission Castings	12.0	—
Adv Materials Partnerships	25.0	25.0
High Temp Superconductivity	17.7	4.0
Military Medical/Trauma Care	14.9	29.1
Advanced Materials Subtotal	295.2	214.4
Advanced Electronics:		
Electronics Sciences	35.2	42.6
High Definition Systems	81.6	48.0
MIMIC	20.5	—
IR Focal Plane Arrays	44.1	36.7
Multi-Chip Modules	24.4	22.6
Electronic Module Technology	94.7	111.9
Environmental Manufacturing	8.8	11.2
MAFET	22.3	50.7
Composite Materials Manufacturing	6.6	7.9
Advanced Lithography	57.7	39.0
DOD/CTC CALS Initiative	38.3	34.2
AGILE Manufacturing	30.0	31.0
U.S./Japan Management Training	10.0	10.0
SEMATECH	89.2	89.6
Advanced Electronics Subtotal	563.4	535.4
Advanced Simulation	82.7	79.0
Other (MARITECH)	52.0	49.7
Technology Reinvestment	443.2	500.0
Non-ARPA/SBIR	234.7	177.1
TOTAL Dual-Use Investments	$2,062.7	$1,965.5

DUAL USE TECBNOLOGY

Senator SMITH. Do you agree that all the activities under the programs in the dual-use category should be judged on how well they serve the three goals laid out in the strategy and in your statement?

Dr. KAMINSKI. Yes. Those programs specifically targeted toward dual-use technology should contribute to one or more of the three pillars which support our dual-use strategy.

AFFORDABLE COMPOSITES FOR PROPULSION

Senator SMITH. Dr. Kaminski, in Dr. Hermann's testimony, he mentions that DOD participation in the Affordable Composites for Propulsion program will be on the order of $130 million over the 5 year program. Is that funding fully provided up front out of the fiscal year 1993 funds or will we have to provide continued funding to complete the project? If continued funding will be required, where is this reflected in the budget documents we receive annually? This is a project on a scale comparable to other R&D programs that we specifically review and authorize each year. How do we ensure that we have sufficient visibility into the funding tail for many of these larger projects that start with a relatively small amount of funding?

Dr. KAMINSKI. The Affordable Composites for Propulsion project is not fully funded up front. To date, the DOD has obligated $42.5 million toward the project. Funding for additional options will be provided on a yearly basis from that year's appropriation, contingent on continued technical progress and defense relevance. The administration includes the funds necessary for these outyear options in our Future Years Defense Program, and in annual budget requests. ARPA provides Congress with a list of all options over the course of the TRP.

While the size of the Affordable Composites for Propulsion project is larger than a typical TRP project, APPA is managing this project as they would any major technology effort.

EXIT CRITERIA

Senator SMITH. Dr. Kaminski, one of the challenges in dealing with dual-use technologies is determining when it is appropriate to reduce or cease funding based on the behavior of the commercial marketplace in choosing to adopt or not adopt a technology. There has been some criticism that we have funded the X-ray lithography programs at over $500 million with no commercialized technology in sight. We have also funded the SEMATECH consortium beyond the 5 years originally envisioned under the program. How do we do this better in the future to maximize the use of our scarce R&D funds? As we engage in new dual-use program under the TRP and in the core program, are you establishing stricter milestones and exit criteria for the Government?

Dr. KAMINSKI. For TRP efforts, each project is defined from the outset as lasting for a fixed time period and receiving a fixed amount of TRP funds. The statement of work agreed upon before the project starts specifies these boundaries, and designs TRP's exit from the project. In general, TRP tries to exit projects at the end of the research stage, before final development and certification of the final product, but the specific exit point depends on the nature of the project and its technology.

If the project goes badly, or if it moves away from ARPA's defense goals, ARPA ends its suppot. This has already happened for some projects. In addition, because the industry participants are sharing the cost of the project, if the companies have difficulties, they also can end the project.

Outside of the TRP, ARPA's core efforts have historically tried also to have defined exit points. Many ARPA programs include at the outset plans to transition the technology to the military services. Under Larry Lynn, with his emphasis on working with the warfighter and his experiences with the Advanced Concept Technology Demonstrations, I would expect to see this trend expanding.

QUESTIONS SUBMITTED BY SENATOR JOHN MCCAIN

MILITARY RELEVANCE

Senator MCCAIN. Dr. Kaminski, you stated in your testimony that "TRP projects must have defense utility and military application." What exactly is "defense utility" and "military application?" Could you please define "military relevance"?

Dr. KAMINSKI. The definition of "defense utility" and "military application" as applied to TRP projects is no different than for any other Defense R&D project. Projects are selected that will have a significant impact on current and future military capabilities and readiness, either by developing a new technology or by providing a significant improvement in the cost and availability of existing military technologies. Thus, while leveraging commercial technology is the means for TRP, the ends of a TRP project are no different than traditional Defense R&D. All TRP development projects provide these benefits, and, hence, yield significant military benefit.

HIGH PRIORITY DEFENSE NEEDS

Senator MCCAIN. Dr. Kaminski, according to the information package that ARPA sent to potential participants in the 1995 TRP competition, defense relevance is defined as "a result of future commercialization of product/process:

— a critical defense technology is preserved;

— a defense capability is more affordable;

— a significant improvement in health, safety or environment (especially in manufacturing) is accomplished.

Does the senior ARPA leadership understand what constitutes high-priority defense needs?

Dr. KAMINSKI. I have unqualified confidence in the ability and judgment of ARPA's leadership to understand and meet defense needs. The senior ARPA leadership has a proven record of forty years of understanding and developing technology critical to advanced weapon systems. This is why ARPA was assigned the task of managing TRP in the first place. We believe that the TRP Technology Development portfolio stacks up well against any in DOD.

ARPA's ability to assure the defense relevance of TRP's projects was, in fact, substantiated by the GAO's assessment. They found that six of the nine Technology Development projects they looked at directly "addressed a specific military need, including a weapon system or the manufacture of that system." The other three were found to reduce costs of DOD products or preserve an element of the industrial base essential for Defense.

The last criterion to which you refer, requiring that "a significant improvement in health, safety or environment (especially in manufacturing) is accomplished," is derived directly from the specific legislation creating the Defense Advanced Manufacturing Technology Partnerships statutory program (10 U.S.C. 2522). 10 U.S.C. 2522 is one of the underpinning statutes used to create the TRP.

Senator McCAIN. Mr. Cooper, the power generator project that you identified as directly meeting a military need seems to have substantial commercial benefit. Can you tell me how large the commercial market: is in comparison to the military market?

Mr. COOPER. According to information we obtained on the project, the military market is projected to level out at roughly 5 percent of the commercial market over the long-term. However, military sales are expected to be the initial thrust with commercial sales to follow-on later. Based on conservative sales forecasts, combined with reasonable investments by industry and the TRP, a commercially sustainable business could match DOD's $15 million per year sales volume within five years and increasingly exceed DOD sales thereafter.

Senator McCAIN. Mr. Cooper, you identified a number of changes that Congress made in the TRP process to ensure greater defense relevance. Can you tell me what steps ARPA has taken, by its own initiative, to increase defense relevance?

Mr. COOPER. For the most part, I believe that congressional direction made the most significant changes to the TRP to ensure greater defense relevance. However, ARPA provided for service representation on the TRP staff that ensured some service input during the fiscal year 1993 and 1994 competitions. Further, ARPA obtained service input to the focus areas that were to be used for the fiscal year 1995 TRP competition.

Senator McCAIN. Were the military services represented on all of the TRP evaluation panels? What portion of the panel were they not represented on? For the panels on which they served, did the military service representatives specifically review each proposal?

Mr. COOPER. The military services were not represented on all of the TRP evaluation panels used for the fiscal year 1993 TRP competition. More specifically, military service representatives were not members of 13 of the 62 panels at the first two levels of the proposal review process.

At the lowest evaluation levels, the proposals did not have to be reviewed by a DOD representative. The only requirement during the evaluation process was that at least three subject matter experts read each proposal. This requirement could be satisfied by having proposals read by representatives from such agencies as the National Aeronautics and Space Administration and the Department of Transportation. However, ARPA maintains that each proposal was discussed by the full panel, which in technology development, always included one or more DOD representatives.

[Whereupon, at 4:05 p.m., the hearing was adjourned.]

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